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START 3

Superfund Technical Assessment and Response Team 3 - Region 8

United States
Environmental Protection Agency
Contract No. EP-W-05-050

SAMPLING ACTIVITIES REPORT

GLADSTONE TREATMENT PLANT TBA
San Juan County, Colorado

TDD No. 0509-41

SEPTEMBER 18, 2006

URS
OPERATING SERVICES, INC.

In association with:
TechLaw, Inc.
LT Environmental, Inc.
TN & Associates, Inc.
Garry Struthers Associates, Inc.

SAMPLING ACTIVITIES REPORT
GLADSTONE TREATMENT PLANT TBA
San Juan County, Colorado

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1.0 INTRODUCTION

This document is submitted in accordance with the task elements specified in the Gladstone Treatment Plant Targeted Brownfields Assessment (TBA) Technical Direction Document (TDD) 0509-41 dated September 29, 2005, issued to URS Operating Services, Inc. (UOS) Superfund Technical Assessment and Response Team 3 (START 3) in Region 8 of the U.S. Environmental Protection Agency (EPA). Work performed for this project is a continuation of work begun under TDD 0505-0008 issued to START2. The objective of this project is to conduct a Targeted Brownfield Assessment (TBA) of water treatment system options for Cement Creek near Gladstone, located within the Animas River watershed, San Juan County, Colorado (Figure 1). Over the past 12 years, various agencies, business owners, and community groups, under the guidance of the Animas River Stakeholders Group (ARSG), have facilitated numerous activities to reduce the impact of historic mining on the Cement Creek/Animas River watershed. This TBA was funded by EPA at the request of San Juan County and the ARSG to evaluate options for a new plant to treat water from the American Tunnel and other mines in the area to reduce the impact of historic mining on water quality in the Animas River. In order to evaluate water treatment scenarios and methods, recent stream and adit flow rates and water quality data for potential water sources were required. This report presents the results of sampling Cement Creek and various mine discharges near Gladstone during July, September, and November 2005. The data will be used to assist in development of the Gladstone Treatment Plant TBA Evaluation Report.

This Sampling Activities Report (SAR) presents laboratory results for samples collected during three sampling events conducted on July 20 and 21, September 20 and 21, and November 17, 2005. Water samples were collected at 11 locations in July, 14 locations in September, and 2 locations in November from mine adit discharges and streams based on the goal of the sampling event and accessibility of the sampling locations. Samples were submitted for laboratory analysis of total and dissolved Target Analyte List (TAL) metals and several parameters useful in assessing water treatment (acidity, alkalinity, chloride, fluoride, nitrate, nitrite, sulfate). Samples collected in July were also submitted for low detection level mercury analysis. Three bulk samples were collected in September for use by UOS subcontractor Canadian Environmental and Metallurgical, Inc (CEMI) to assist in preparation of a conceptual design of a water treatment plant. Stream and adit discharge flow rates were measured at each sample location.

The stream flow and water quality data were subsequently used in conjunction with sample results to calculate metal loading associated with each location during each sampling event. Individual and combined metal loads associated with adits discharging into Cement Creek were compared to metal loads in Cement Creek at Gladstone as a means to select water sources for treatment. Based on EPA and ARSG direction, two water

treatment alternatives involving different input water were evaluated and the potential effects on water quality at U.S. Geological Survey (USGS) gauge stations CC18, CC48, and A72 were calculated. The data were also used to determine parameters (such as treatment pH, lime requirements, and sludge generation) for use in the conceptual design and a preliminary cost estimate for two water treatment plant scenarios for the Gladstone site.

2.0 HISTORY

Gladstone is the site of an historic mining town that developed in the 1880s with the advent of mining in the surrounding area (Figure 1). The town was the central location and railroad terminus for the milling and shipping of mine ores from the surrounding three-square-mile valley. The town declined in the 1920 s and no remnants of the town remain.

The largest mine in the area known as the Animas Mining District was the Sunnyside Mine that closed in the 1990s and is now nearing completion of reclamation. The Gold King Mine is currently in inactive status. Both of these mines were partially accessed through the American Tunnel that has its portal in Gladstone (San Juan County, Undated). At one time, the American Tunnel drained as much as 1,600 gallons per minute (gpm) of water from the mines. A lime feed and settling pond type treatment facility was constructed in Gladstone in 1979 by Standard Metals Corporation and later operated by new owner Sunnyside Gold Corporation (SGC). Water discharging from the American Tunnel was treated as required by the Colorado Health Department and later Colorado Department of Public Health and Environment (CDPHE) water discharge permit. Under jurisdiction of a court consent decree to terminate their discharge permit, SGC installed three bulkheads over a six year time period that reduced American Tunnel discharge from 1,600 gpm to less than 100 gpm. In January 2003, the treatment facility, operations, and permit were transferred to Gold King Corporation (GKC). At that time GKC owned much of the land through which the American Tunnel passes. GKC operated the treatment facility until September 2004, treating the remaining American Tunnel discharge and the Gold King Mine 7th Level discharge. Because of financial problems and the loss of the lease for the property where the settling ponds are located, GKC terminated treatment operations. Discharge from the American Tunnel is now considered non-compliant (San Juan County Undated).

In addition to American Tunnel water that now flows from the American Tunnel into Cement Creek without treatment, other upstream mines contribute to the metals load in Cement Creek and ultimately the Animas River. Numerous abandoned mines exist within a two-mile radius of Gladstone. They include the Grand Mogul, Mogul, Red and Bonita, Eveline, Joe and John, Lark, Upper Gold King, and Silver Ledge mines

(Figure 2). Some of these mines have acid mine drainage discharge between 1 and 650 gpm that flows directly or indirectly into Cement Creek and eventually into the Animas River, the confluence of which is approximately seven miles downstream of Gladstone (San Juan County Undated). These sources have been sampled intermittently during Colorado Division of Mining and Geology (DMG) and USGS studies; however, several of the adits have not been sampled since 1997 and not since installation of the bulkheads in the American Tunnel or the installation of a bulkhead in the Mogul in 2003.

In 1998 DMG prepared a comprehensive study of nearly 80 adit and creek discharge locations and numerous waste rock dumps in Cement Creek (Colorado Division of Mining and Geology (DMG) 1998). The basis for the report included sampling during high flow and low flow conditions. Data from this report provided the basis for the adit discharge ranking that is presented in the Use Attainability Analysis (UAA) prepared by ARSG in 2001 (Animas River Stakeholders Group (ARSG) 2001). The UAA identifies the following seven metals of concern for Cement Creek: aluminum, cadmium, copper, iron, lead, manganese, zinc. Aluminum and iron are noted as arising from predominantly natural sources. Cadmium, copper, and zinc were given the highest weight factors in the ranking system. The UAA adit ranking procedure also includes the use of pH, acidity and metal load data for both high and low flow.

The USGS compiled mine adit sample and field parameter data for the Cement Creek drainage and other Animas River watershed drainages. This included published and unpublished data from the U.S. Bureau of Mines, Colorado Geological Survey, DMG, and ARSG. The report included the analysis of time-series data for seven mine sites and concluded that the chemistry of mine adit discharge from individual mines does not vary during most of the year. However some mines do show some seasonal effects (U.S. Geological Survey (USGS) 2004).

3.0 OBJECTIVES

The objective of the three sampling events was to obtain current flow rate and water quality data from mine adits known to release large loads of metals into Cement Creek and from Cement Creek in order to:

- Evaluate the relative effect of treating the individual sources on water quality in Cement Creek (as measured at CC48) and in the Animas River (A72) (Figure 1);

- Begin to determine seasonal variations in water flow rates and water chemistry at selected sample locations; and

- Provide data for use in the conceptual design and cost evaluation for a water treatment plant near Gladstone.

4.0 FIELD ACTIVITIES

Field activities were guided by the July 2005 Field Sampling Plan (FSP). This plan was developed under the direction of Sabrina Forrest, EPA Site Assessment Manager. Input from the ARSG and the USGS concerning sample locations was incorporated into the FSP (UOS 2005a). Sample locations were selected by ARSG based on the adit discharge priority list developed based on DMG 1996-97 sample results (DMG 1998). Samples were collected by submerging sample containers in pooled adit or creek water or by filling sample bottles directly from piping (Eveline Mine sample). Samples designated for dissolved metals analysis were filtered using a 0.45 micron disposable filter. Nitric acid was used as a preservative for samples submitted for total or dissolved metals analysis. For quality assurance/quality control purposes, one duplicate sample was collected per twenty samples for this project. A duplicate sample was collected from the Cement Creek just below American Tunnel sampling location during both the July and September sampling events. The duplicate sample was collected and processed immediately after the primary sample was collected from that location.

Global Positioning System (GPS) coordinates were collected at each sample location using a Trimble GPS instrument. Photographs of each sample location were taken (Appendix A). Sample location descriptions and water field parameters pH, conductivity, and temperature were recorded at each sample location (Tables 1, 2, 10, and 18). The water flow rates associated with each sample were measured using a Marsh McBirney velocity gauge, a one- or four-inch flume, or a five-gallon pail. The flow rate measurement method is designated next to the flow rate reported for each sample location.

4.1 JULY 2005 FIELD WORK

UOS START members Jerry Goedert and Eric Scott mobilized to the site and conducted field activities on July 20 and 21, 2005. Field modifications to the FSP included:

- The Cement Creek sample was collected upstream of the culvert at Gladstone and the flow rate was measured approximately 100 feet downstream of the confluence of the North Fork into Cement Creek because of extreme turbulence in Cement Creek (Figure 2).

- The Lark adit and Joe and John adit samples were replaced by Upper and Lower Prospect Gulch samples because of low flow (less than one gpm) from these adits. The Upper Prospect Gulch location was comparable to the USGS PG-11 location. The Lower Prospect Gulch location was comparable to the USGS PG800 location. The rationale for this modification was that if the discharge from the two mines or other Upper Prospect Gulch mines was diffuse and/or from seeps, the metal load increase, if any, would be reflected between the Upper Prospect Gulch and Lower Prospect Gulch sample locations.

- The Red and Bonita adit discharge sample was collected from the toe of the waste rock pile slope because UOS was unable to obtain property access from the landowner. The sample results may show higher metal concentrations than if the sample had been collected near the adit because the water contacts waste rock after discharge from the collapsed adit but prior to being sampled. The measured flow rate may also be different than the flow rate exiting the adit.

- The Grand Mogul adit discharge sample was collected approximately 100 feet downgradient of the toe of the waste rock dump and collapsed adit because the mine discharge was dispersed. The water sample may have higher metal concentrations than if it had been collected near the adit because the water contacted waste rock prior to sampling. Alternatively some metals such as iron could also have lower concentrations because of oxidation and precipitation.

- The Silver Ledge sample was collected at the upstream culvert under the county road because UOS was unable to obtain property access from the landowner. Water does not contact waste rock between the adit and the sample location so no impacts on water sample results are expected.

- A portion (13 gpm) of the Upper Gold King 7th Level discharge entered a three-inch-diameter pipe that discharged near Gladstone and therefore did not enter the North Fork, reducing loading from the Upper Gold King to the North Fork. However, the Upper Gold King 7th Level metal loading to the Cement Creek sample location is unaffected by this diversion.

4.2 SEPTEMBER 2005 FIELD WORK

UOS START members Jerry Goedert and Eric Scott mobilized to the site and conducted field activities on September 20 and 21, 2005. Samples and field measurements were collected using the same procedures as in July (Table 10). At the ARSG's request, three adit discharge locations were added for the September sampling event: Gold Point, Big Colorado, and Black Hawk. UOS visited five additional mines (Mogul shaft, Adams, Pride of Bonita, Lead Carbonate, and an unnamed adit between the Mogul and Gold Point), but these were not sampled because they were not producing water.

The following are field notes including modifications from the July sampling event:

- Drainage approximately 150 feet downgradient from the Lark and the Joe and John mines was located and sampled instead of the Upper and Lower Prospect Gulch locations that were sampled in July to conform with the sampling plan. It is unknown whether this drainage originates from either mine.

- Gold Point, Black Hawk, and Big Colorado samples were collected from approximately 10 to 90 feet from the adits because flow was dispersed immediately from the adits.

- Sandbags were placed in Cement Creek approximately 50 feet downgradient of the American Tunnel discharge to facilitate flow rate measurement. The sample was also collected at this location. This change in sample location is not expected to impact flow rate or water quality data relative to the location used for the July sampling event.

- UOS obtained access to the Silver Ledge adit property so the sample was collected near the adit, approximately 50 feet from where the July sample was collected. No difference in water quality or flow rate data collected was expected for the July or September sampling events because of this change.

- Three bulk samples were collected and shipped to CEMI for determination of water treatment parameters including establishing dissolved metal concentrations versus pH. Samples included 1) a composite of Mogul, Red and Bonita, Upper Gold King 7th Level, and American

Tunnel discharge water with proportions based on the September 2005 flow rates; 2) Cement Creek at Gladstone; and 3) Silver Ledge.

4.3 NOVEMBER 2005 FIELD WORK

UOS START members Jerry Goedert and Eric Scott mobilized to the site and conducted field activities on November 19, 2005. Sampling was conducted using the same procedures as in July and September. Snow conditions prevented access to all except two of the previously sampled locations, North Fork and Cement Creek.

5.0 SAMPLE ANALYSIS AND RESULTS

Samples collected during each sampling event were submitted to the EPA Contract Laboratory Program (CLP) laboratory for dissolved and total metals analysis and to a commercial laboratory for non-standard analytes. In July, samples were submitted to Sentinel, Inc. in Huntsville, Alabama, for dissolved and total TAL metals analysis; to Pace Analytical, Denver, Colorado, for mercury analysis using EPA Method 7470 to obtain lower detection levels than the TAL metals method; and to Northern Laboratories, Inc. in Billings, Montana, for the following non-standard analytes: acidity, alkalinity, anions including chloride, fluoride, sulfate, and nitrate/nitrite. Samples collected in September were submitted to Sentinel, Inc. for dissolved and total TAL metals analysis and to Northern Laboratories, Inc. for acidity, alkalinity, anions including chloride, fluoride, sulfate, nitrate/nitrite analyses. Samples collected in November were submitted to Sentinel, Inc. for dissolved and total TAL metals analyses.

5.1 LABORATORY RESULTS

The analytical results for samples collected in July are presented in Tables 2 and 3; September analytical results are presented in Tables 10 and 11, and November analytical results are presented in Table 18. Laboratory data sheets for each sampling event are presented on a compact disk (CD) as Appendix B.

5.2 DATA VALIDATION

TechLaw, a UOS subcontractor, was tasked to validate the TAL metals data from each sampling event. TechLaw performed the data validation using the EPA Functional Guidelines for Inorganic

Data Review (EPA 2002). The validation reports are presented in Appendix B and include the mark-up of the laboratory data sheets. Changes in values and data qualifiers were incorporated into the data tables contained in this report. Significant findings are as follows:

July Results

Dissolved manganese results were rejected because laboratory quality control standard requirements were not met. Based on close agreement of July dissolved and total manganese results, it appears that the dissolved manganese results are usable for the purposes of this project.

September Results

Dissolved metal results for barium, lead, beryllium, manganese, and zinc were qualified J/UJ because the matrix spike recovery was less than 75 percent and the serial dilution percent difference was greater than 10 percent and the original sample result was at least 50 times the method detection level. Lead, manganese, and zinc are metals of concern. Therefore data interpretation for these metals is subject to the added data qualifiers.

November Results

All zinc results and dissolved cadmium, copper, and lead results were J qualified because the serial dilution percent difference was greater than 10 percent and the original sample result was at least 50 times the method detection level. These are metals of concern. Therefore data interpretation made for these metals is subject to the added data qualifiers.

5.3 DUPLICATE SAMPLE RESULTS EVALUATION

As an additional means of evaluating the quality of laboratory data relative percent differences (RPDs) were calculated for duplicate sample results. RPD is calculated as follows with C_1 and C_2 being the metal concentrations from a given analysis method:

$$RPD = | (C_1 - C_2)| / (C_1 + C_2)/2 |$$

The RPDs for the metals of concern range from 0.0 (total aluminum) to 14.2 percent (total lead) and 0.3 percent (total lead) to 7.0 percent (dissolved copper) for the July and September sampling events, respectively (Tables 5 and 13). The RPD is considered acceptable up to 35 percent (U.S.

Environmental Protection Agency (EPA) 2002a). Based on the RPDs for the July and September sampling events, the data are of excellent quality.

6.0 DATA INTERPRETATION

Several tables were prepared to assist in interpreting the flow rate and water quality data for use in water treatment system evaluation, conceptual design, and cost estimation. Comparisons were performed to evaluate seasonal and historic variations in flow rates and water chemistry, variations in dissolved and total metals concentrations, metal loading from various mine adits and segments of Cement Creek, and potential load reductions that might be seen at CC48 and A72.

6.1 POTENTIAL SEASONAL FLOW RATE AND WATER CHEMISTRY VARIATIONS

Flow rates and water quality from the six adits and American Tunnel were relatively consistent between the sampling events with the following exceptions. The Grand Mogul discharge decreased from 110 gpm in July to 0.5 gpm in September, which is consistent with stakeholders statements that flow from the Grand Mogul is seasonal (Tables 2 and 10). The Upper Gold King flow increased from 42 gpm in July to 142 gpm in September.

The weighted average metal concentrations in water from three adits (Mogul, Red and Bonita, and Upper Gold King 7th Level) and American Tunnel range from 3 (aluminum) to 14 (iron) times those of Cement Creek in July and from 1.3 (aluminum) to 2.5 (iron) times those of Cement Creek in September. The combined flow rate of the adits/tunnel was 9 percent that of Cement Creek in July (Table 8) and 41 percent that of Cement Creek in September (Table 16).

The Cement Creek flow rate and water chemistry was similar in September and November. However, during November Cement Creek had a lower flow rate but the water was more concentrated than July. While the flow rate at North Fork declined in November from rates seen in July and September, the water chemistry was similar to September (Tables 2 and 10).

6.2 COMPARISON OF DISSOLVED METALS RESULTS WITH HISTORIC DATA

Dissolved metals concentrations for July and September were compared with historic sample results from the same location at the same time of year or with averages of historic sample results. Historic

data came primarily from the DMG Cement Creek Reclamation Feasibility Report (DMG 1998). USGS data presented in the Mine Inventory Compilation of Mine-Adit Chemistry Data were also used when DMG data were unavailable (USGS 2004). Variations in water chemistry and flow rates may be the result of a variety of factors. Seasonal or annual variations would be expected. Variations may have also occurred due to discontinuation of water treatment, implementation of mine cleanup projects, or the change in hydrogeological conditions from the installation of three American Tunnel bulkheads and one Mogul Mine bulkhead installed from 1996 to 2003.

6.2.1 Variations in Water Chemistry

For purposes of this comparison, water concentration differences of 50 percent lower than or 200 percent greater than historical values were used to indicate significant differences.

The upper and lower Prospect Gulch samples had the highest number of metals of concern (iron, aluminum, and manganese) with concentrations significantly greater in July 2005 than historic values (Table 6). Possible explanations for this apparent change are unknown. The Lark adit had metal concentrations significantly higher in September 2005 than historic values (Table 14).

The Mogul and Red and Bonita adit discharges had the highest number of metals of concern with concentrations significantly lower in July 2005 than historic values (Table 6) and Gold Point, Red and Bonita, and Mogul adit discharges had the highest number of metals of concern with concentrations significantly lower in September 2005 than historic values (Table 14).

The July 2005, Cement Creek water chemistry data were comparable to historic data with the exception of manganese, which was approximately seven times the historic value (Table 6). Cement Creek had significantly higher concentrations of all of the metals of concern in September 2005 than were seen in Cement Creek historically (Table 14).

6.2.2 Variations in Flow Rates

In July 2005, flow rates from the Grand Mogul and Red and Bonita adits were 6.5 and 35 times historic flow rates. However, as the historic data also indicated, the Grand Mogul

discharge varies significantly with season (Table 6). In September 2005, flow rates from the Red and Bonita and Upper Gold King 7th Level were 22 and 3.5 times historic data (Table 14). These are the most significant departures from historic flow rates. The increase in Red and Bonita flow appears to be a relatively recent occurrence and may be a delayed effect of the American Tunnel bulkhead installation.

6.3 COMPARISON OF DISSOLVED AND TOTAL METALS RESULTS

Dissolved and total metals results were compared for all three sampling events (Tables 4, 12, and 18); a 20 percent difference between dissolved and total concentrations was arbitrarily used to identify significant differences. The primary difference between dissolved and total metals concentrations is seen for iron. Seven of ten samples in July and six of fourteen samples in September had 20 percent or greater difference between dissolved and total iron concentrations. For one of the July samples with a greater than 20 percent difference, the dissolved iron concentration was higher than the total iron concentration. There were no significant differences between total and dissolved metals in November (Table 18). This may indicate that iron is precipitating in the water after being discharged from the reducing conditions in the adit. Of the other metals of concern, only zinc in July (two samples, one of which was higher in the dissolved sample) and aluminum in September (two samples) showed a 20 percent or greater difference between dissolved and total concentration (Table 4).

6.4 LOADING FROM MINE ADITS AND AMERICAN TUNNEL

The relative loading associated with each sample location was evaluated based on measured flow rates and metal concentrations. Ratios of the metal load from each location (and in some cases combinations of locations) to the total Upper Cement Creek load at CC18 are also presented.

Among the adits sampled, the Upper Gold King 7th Level and Red and Bonita contributed the highest metal load to Cement Creek (Tables 7 and 15). The Upper Gold King 7th Level or Mogul had the highest concentrations of each of the metals of concern in both July and September (Tables 1, 2, 10, and 11).

Several adits had negligible contribution to the loading in Cement Creek. The Eveline, Big Colorado, Black Hawk, Gold Point, Joe and John, and Lark metal loads as a ratio to Cement Creek were negligible compared to the other metal sources (Tables 7 and 15). Except for lead (0.31) the metal

loads contributed by the mines in Prospect Gulch are a ratio of less than 0.10 to Cement Creek metal loads (Table 7). The ratio of Silver Ledge to Cement Creek metal loads range from 0.01 (lead) to 0.29 (iron) (Table 7). In September, the ratio of Silver Ledge metal loads to Cement Creek ranged from 0.00 (copper) to 0.12 (iron) (Table 15).

During July, three Upper Cement Creek adits (Mogul, Red and Bonita, Upper Gold King 7th Level) and the American Tunnel contributed from 32 percent (aluminum) to 131 percent (iron) of the metal loads to Cement Creek (Table 7). In September, these sources contributed from 55 percent (aluminum) to 102 percent (iron) of the metal loads to Cement Creek (Table 15). Precipitation of iron between the source and the Cement Creek sampling location may explain greater than 100 percent iron being accounted for (Table 7). As expected from historic water quality trends, the contribution of the adits to the load in Cement Creek is higher during lower flow periods.

The loading from the Upper Gold King 7th Level and North Fork Cement Creek is compared to determine if there are unidentified sources of unidentified metal loading to North Fork (Tables 7 and 15). In July, Upper Gold King 7th Level contributed approximately 30-40 percent of the metal load to North Fork indicating the potential that another source is present in this drainage (Table 7), but in September, the adit contributes approximately 83 (aluminum) to 170 (lead) percent of the metal load to North Fork. This may indicate that the Upper Gold King is the primary source in this drainage during low flow (Table 15) but not necessarily during high flow.

6.5 EVALUATION OF POTENTIAL RESULTS OF TREATMENT ON CC48 AND A72 WATER QUALITY

Because of the complex nature of Cement Creek hydrology, it is difficult to assess the effect of water treatment on water quality at CC48 and A72. Upstream loads are sometimes higher than downstream loads, indicating that some contaminants are precipitated or complexed between the source of loading and the measuring points. Additional studies, monitoring, and modeling would be required to accurately estimate the effect of water treatment on downstream water quality. In the absence of the time and resources to perform those efforts, the metal load reduction expected at gauging stations on Cement Creek (CC48) and Animas River (A72) under various water treatment scenarios was calculated assuming the entire load reduction at Gladstone would be seen at the gauging stations. Three lime precipitation water treatment scenarios are evaluated for treatment of three discreet adits and the American Tunnel at a nominal flow rate of 500 (Alternative 1), and upper Cement Creek at a

flow rate of 1,200 gpm (Alternative 2) (Tables 9 and 17). During the time that the alternatives were formulated, treatment of Silver Ledge discharge was considered. However, ARSG determined that the efficiency of treating the relatively low metal concentrations present in Silver Ledge water would be low in comparison to the two alternatives presented above and therefore consideration of treating this water was discontinued.

The calculations performed in this report assume that water for each alternative will be treated to the concentrations obtained at pH 9 during the treatability study performed on the two water sources (CEMI 2006). Data for CC48 or A72 concurrent with the sampling events was not available, so flow rate and water quality, data from similar dates but in 2004 were used in the calculations. CC48 and A72 data were available for July 7 and August 19 and a straight-line extrapolation was performed to determine metal concentrations and flow rates for July 21.

Using this method of comparison, the metal load reduction realized at CC48 from water treatment Alternative 1 ranged from 7 percent (aluminum) to 37 percent (zinc) reduction in July and from 22 percent (aluminum) to 132 percent (copper) reduction in September. The metal load reduction realized at CC48 from water treatment Alternative 2 ranged from 0 percent (manganese) to 28 percent (copper) in July and from 40 percent (aluminum) to 155 percent (copper) in September (Tables 9 and 17). The metal load reduction realized at A72 from water treatment Alternative 1 ranged from 3 percent (aluminum) to 53 percent (copper) reduction in July and from 4.8 percent (aluminum) to 147 percent (copper) reduction in September. The metal load reduction realized at A72 from water treatment Alternative 2 ranged from 0 percent (manganese) to 47 percent (copper) in July and from 8.9 percent (aluminum) to 320 percent (copper) in September (Tables 9 and 17). Load reductions exceeding 100 percent indicate that precipitation or other geochemical processes are removing those metals from Cement Creek between the source and the measuring points.

During July, a higher load reduction is seen at CC48 and A72 using Alternative 1 than Alternative 2 because the adit/tunnel discharge has much higher concentrations of contaminants despite the lower flow rates. During September, a higher load reduction is seen at CC48 and A72 using Alternative 2 because a higher portion of the Cement Creek flow comes from the adits during lower flow periods causing higher metal concentrations in Cement Creek and because Alternative 2 consists of treating a higher volume of water. To use this information effectively for water treatment scenario evaluation, load reduction per unit volume of water treated will also be considered in the Water Treatment Evaluation Report.

7.0 LIST OF REFERENCES

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URS
OPERATING SERVICES

GLADSTONE WATER TREATMENT PLANT
SAN JUAN COUNTY, COLORADO
FIGURE 1: Site Location Map

July 2006

UOS - START 3
TDD No. 0509-41

▲ USGS Gaging Stations

1:45,000

0 0.25 0.5 1 Miles

N

Source: NAIP 1 meter Aerial Imagery, 2005.
http://waterdata.usgs.gov/nwis

TARGET SHEET

EPA REGION VIII

SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 1185363

SITE NAME: UPPER ANIMAS MINING DISTRICT

DOCUMENT DATE: 09/18/2006

DOCUMENT NOT SCANNED

Due to one of the following reasons:

- ☐ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☑ OVERSIZED
- ☐ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ☐ TYPES OF DOCUMENTS NOT TO BE SCANNED
  (Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

FIGURE 2: SITE AND SAMPLE LOCATION MAP

Contact the Superfund Records Center to view available document.
(303) 312-6473

TABLE 1
Sample Location Descriptions

July 2005 Sample ID	Sample Location	Description
GTSW01D	Cement Creek downstream of American Tunnel	Immediately upstream of the culvert at Gladstone
GTSW02D	American Tunnel	Pooled water just inside the tunnel
GTSW03D	Eveline	Pipe from which water exits the adit
GTSW04D	Upper Prospect Gulch	USGS location referred to as PG 11
GTSW05D	Lower Prospect Gulch	USGS location referred to as PG 800
GTSW06D	Silver Ledge	Ponded area immediately upstream of the culvert
GTSW07D	Red and Bonita	Drainage channel along waste rock toe of slope
GTSW08D	Upper Gold King (7th Level)	Immediately inside east adit
GTSW09D	Mogul	Small pooled area approximately 25 feet from adit opening
GTSW10D	Grand Mogul	Approximately 100 feet from the waste rock toe of slope
GTSW11D	North Fork at Cement Creek Confluence	Immediately upstream from the county road
September 2005 Sample ID	**Sample Location**	**Description**
GTSW01D	Cement Creek downstream of American Tunnel	Approximately 50 feet downstream of the American Tunnel discharge
GTSW02D	American Tunnel	Pooled water just inside the tunnel
GTSW03D	Eveline	Pipe from which water exits the adit
GTSW04D	Lark	Approximately 50 yards downgradient from the mine toward Prospect Gulch
GTSW05D	Joe and John	Approximately 50 yards downgradient from the mine toward Prospect Gulch
GTSW06D	Silver Ledge	Ponded area immediately upstream of the culvert
GTSW07D	Red and Bonita	Drainage channel along waste rock toe of slope
GTSW08D	Upper Gold King(7th Level)	Immediately inside east adit
GTSW09D	Mogul	Small pooled area approximately 25' from adit opening
GTSW10D	Grand Mogul	Approximately 100 feet from the waste rock toe of slope
GTSW11D	North Fork at Cement Creek Confluence	Immediately upstream from the county road
GTSW12D	Gold Point	Approximately 20 feet from the collapsed Gold Point adit
GTSW13D	Black Hawk	Approximately 30 yards from the Black Hawk adit
GTSW14D	Big Colorado	Approximately 10 feet from collapsed adit
November 2005 Sample ID	**Sample Location**	**Description**
GTSW01D	Cement Creek downstream of American Tunnel	Approximately 50 feet downstream of the American Tunnel discharge
GTSW11D	North Fork at Cement Creek Confluence	Immediately upstream from the county road

TABLE 2
July 2005 Dissolved Metals Sample Results
Concentrations in µg/L

Sample ID EPA Sample ID Sample Location	GTSW01D MH1FS4 Cement Creek downstream of American Tunnel	GTSW02D MH1FS5 American Tunnel	GTSW03D MH1FS6 Eveline	GTSW04D MH1FS7 Upper Prospect Gulch	GTSW05D MH1FS8 Lower Prospect Gulch	GTSW06D MH1FS9 Silver Ledge	GTSW07D MH1FT0 Red and Bonita	GTSW08D MH1FT1 Upper Gold King (7th Level)	GTSW09D MH1FT2 Mogul	GTSW10D MH1FT3 Grand Mogul	GTSW11D MH1FT4 North Fork at Cement Creek Confluence	GTSW12D MH1FT5 GTSW01D Duplicate
Latitude	37.89073494	37.89094793	37.8882571	37.89169	37.89281	37.87665971	37.89678128	37.89457925	37.90982715	37.9101484	37.89512604	
Longitude	-107.6499827	-107.648261	-107.665176	-107.67909	-107.68114	-107.644539	-107.6448654	-107.6383657	-107.6384591	-107.632253	-107.6467579	
Field Parameters												
Flow Rate, gpm (Measurement method)	4200 (1)	95 (2)	4 (3)	510 (2)	600 (1)	630 (4)	210 (2)	42 (2)	21 (2)	110 (2)	380 (2)	
pH (S.U.)	3.46	4.27	3.00	4.53	3.51	5.28	3.08	2.64	3.11	3.05	2.5	
Temperature (°C)	9.8	7.9	6.9	12.4	12.3	5.9	9.0	9.1	7.1	16.9	4.1	
Conductivity (mS/cm)	0.57	2.41	0.63	0.29	0.3	0.81	1.45	3.44	1.39	0.49	1.16	
Analyte												
Aluminum*	3670	7670	12600	2410	2470	1960	3800	64800	8690	4840	16600	3900
Antimony	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Arsenic	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.1	15.3	2.4	1.5	3.4	1.0 U
Barium	18.5	9.4 J	0.74 J	36.5	34.5	6.5 J	7.5 J	1.8 J	13.3	14.7	9.0 J	18.4
Beryllium	1.0	4.0	1.0 U	1.0 U	1.0 U	2.0	3.4	17.4	9.2	1.0 U	3.3	1.0
Cadmium*	13.4	4.9	13	0.69 J-	3.0	3.4	27	169	201	50.5	43.5	13.2
Calcium	72900	440000	5030	31100	31100	162000	245000	377000	213000	14300	90700	78800
Chromium	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	15.2	2.0 U	2.0 U	5.2	2.0 U
Cobalt	18.1 J	123 J	26.8 J	6.1 J	8.4 J	22.9 J	68.1 J	167 J	37.7 J	8.3 J	43.9 J	18.2 J
Copper*	306	19	110	19.7	149	31.7	87.2	8940	193	1770	2450	313
Iron*	6100	139000	16900	276	1780	11700	47200	204000	31800	9590	46500	6420
Lead*	13.7	3.7	2.0	29.7	55.1	1.0 U	72	9.5	313	30.6	2.1	13.5
Magnesium	6680	30900	10900	4410 J	4490 J	8990	18600	41700	13500	4170 J	12500	7210
Manganese*	5650 R	41200	821 R	381 R	386 R	2350 R	23000	49300	28700	3840 R	9600 R	5670 R
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	11.1	60.7	14.6	5.6	6.6	12.7	31	97	22.7	6.2	27.3	11.5
Potassium	674 J	2150 J	1340 J	653 J	606 J	1130 J	1400 J	1150 J	2010 J	593 J	371 J	683 J
Selenium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	0.76 J	5.0 U	5.0 U	0.82 J	5.0 U
Silver	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sodium	10900	50300	5120	1640 J	2560 J	5770	32800	115000	146000	25100	23600	11500
Thallium	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U
Vanadium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.2	1.0 U	1.0 U	1.0 U	1.0 U
Zinc*	3580	17300	1010	176	621	1040	10400	41000	56000	9540	8470	3640

* Chemical of Concern
Data Qualifiers

- R Reported value is "rejected". Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
- J The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
- J- The associated numerical value is an estimated quantity because the Quality Control criteria were not met. The result may be biased low.
- UJ The reported quantitation limit is estimated because Quality Control criteria were not met. The element or compound was not detected.
- U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Flow rate Measurement Methods 1- Marsh McBirney; 2 - Flume; 3- Five-gallon bucket; 4- Culvert/Marsh McBirney

TABLE 3
July 2005 Total Metals and Water Treatment Parameter Sample Results
Concentrations in µg/L

Sample ID	GTSW01	GTSW02	GTSW03	GTSW04	GTSW05	GTSW06	GTSW07	GTSW08	GTSW09	GTSW10	GTSW11	GTSW12
EPA Sample ID	MH1FR2	MH1FR3	MH1FR4	MH1FR5	MH1FR6	MH1FR7	MH1FR8	MH1FR9	MH1FS0	MH1FS1	MH1FS2	MH1FS3
Sample Location	Cement Creek downstream of American Tunnel	American Tunnel	Eveline	Upper Prospect Gulch	Lower Prospect Gulch	Silver Ledge	Red & Bonita	Upper Gold King (7th Level)	Mogul	Grand Mogul	North Fork at Cement Creek Confluence	GTSW01 Duplicate
Flow rate (gpm)	4200	95	4	510	600	630	210	42	21	110	380	
Analyte												
Aluminum*	3830	7070	12900	2660	2580	2200	3570	56600	8210	4890	16000	3830
Antimony	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U
Arsenic	5.0 U	5.0 U	5.0 U	5.0 U	1.5 J	1.9 J	5.0 U	16.6	3.0 J	2.1 J	1.7 J	5.0 U
Barium	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ	18.4 J-	10.9 J-	22.4 J-
Beryllium	2.5 U	4.1	2.5 U	2.5 U	2.5 U	2.5 U	3.7	15.8	9.5	2.5 U	3.5	2.5 U
Cadmium*	13.1	3.9	13.3	2.5 U	3.1	3.7	25.8	156	204	56.2	43.1	13.8
Calcium	73000	362000	5050	30000	29700	147000	213000	287000	188000	14000	81800	71800
Chromium	1.0 J-	3.3 J-	0.7 J-	5.0 U	5.0 U	5.0 U	2.3 J-	19.8	3.1 J-	1.4 J-	6.3	1.1 J-
Cobalt	17.5 J	137	29.8	6.2 J	6.9 J	22.8 J	73.4	190	40.2	7.0 J	46.1	17.1 J
Copper*	330	7.2 J	118	23.1	159	44.6	94	10700	209	1730	2380	321
Iron*	9350	133000	23700	550	2900	17800	43200	169000	47400	9360	42000	8910
Lead*	16.6 J	4.0 J-	5.0 UJ	33.6 J	65 J	13.1 J	67.8 J	2.3 J-	311 J	29.4 J	1.7 J-	14.4 J
Magnesium	6740	27500	10800	4270	4290	8190	16700	34100	12200	3940	11000	6450
Manganese*	5890	39000	922	402	387	2400	20500	52000	26000	3990	8990	5640
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	11.4 J	61.5	15.9 J	6.1 J	6.8 J	12.5 J	31.4	106	23.2	6.1 J	26.4	10.7 J
Potassium	664 J	2090 J	1410 J	653 J	648 J	1110 J	1360 J	1020 J	1960 J	542 J	382 J	655 J
Selenium	17.5 U	17.5 U	1.6 J	17.5 U	17.5 U	17.5 U	17.5 U	3.1 J	17.5 U	17.5 U	17.5 U	17.5 U
Silver	5.0 U	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 U	5.0 U	5.0 U
Sodium	11200	49500	5130	1280 J	2510	5420	31000	104000	139000	24600	22000	10500
Thallium	12.5 U	12.5 UJ	12.5 U	12.5 U	12.5 U	12.5 U	12.5 UJ	12.5 UJ	12.5 UJ	12.5 UJ	12.5 U	12.5 U
Vanadium	25 U	25 U	1.9 J	25 U	25 U	25 U	25 U	2.2 J	25 U	25 U	25 U	25 U
Zinc*	3820	15600	1150	201	681	1110	10100	32900	44500	9830	8350	3710
Mercury (EPA Method 7470)	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.16 UJ	0.10 UJ	0.10 UJ	0.10 UJ
Acidity as $CaCO^3$ (mg/L)	63	370	160	25	40	37	171	1310	294	120	328	68
Acidity as $CaCO^3$ (mq/L)	1.3	7.4	3.2	0.5	0.8	0.74	3.42	26.2	5.88	2.4	6.56	1.4
Alkalinity Bicarbonate as HCO^3 (mg/L)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Alkalinity Carbonate as CO^3 (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
Alkalinity Total as $CaCO^3$ (mg/L)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloride as Cl (mg/L)	1.0 U	2.0	1.0	1.0 U	1.0 U	1.0	1.0 U	2.0	1.0	2.0	1.0 U	1.0 U
Fluoride (undistilled) (mg/L)	1.1	2.76	0.45	0.32	0.25	2.99	3.94	2.31	10.3	1.25	2.53	1.37
Sulfate as SO^4 (mg/L)	277	1820	194	112	124	487	878	2330	859	149	530	279
Nitrate +Nitrite as N (mg/L)	0.11	0.01 U	0.04	0.07	0.07	0.01 U	0.03	0.04	0.02	0.17	0.14	0.1

* Chemical of Concern gpm Gallons per minute

J The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

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UJ The reported quantitation limit is estimated because Quality Control criteria were not met. The element or compound was not detected.

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

TABLE 4
July 2005 Dissolved and Total Metals Sample Results Comparison
Concentrations in µg/L

Sample ID	GTSW01		GTSW02		GTSW03		GTSW04		GTSW05		GTSW06	
Sample Location	Cement Creek downstream of American Tunnel		American Tunnel		Eveline		Upper Prospect Gulch		Lower Prospect Gulch		Silver Ledge	
	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Flow rate (gpm)	4200		95		4		510		600		630	
pH (S.U.)	3.46		4.27		3		4.53		3.51		5.28	
Temperature (°C)	9.8		7.9		6.9		12.4		12.3		5.9	
Conductivity (mS/cm)	0.57		2.41		0.63		0.29		0.3		0.81	
Aluminum*	3670	3830	7670	7070	12600	12900	2410	2660	2470	2580	1960	2200
Antimony	2.0 U	30 U	2.0 U	30 U	2.0 U	30 U	2.0 U	30 U	2.0 U	30 U	2.0 U	30 U
Arsenic	1.0 U	5.0 U	1.0 U	5.0 U	1.0 U	5.0 U	1.0 U	5.0 U	1.0 U	1.5 J	1.0 U	1.9 J
Barium	**18.5**	**100 UJ**	**9.4 J**	**100 UJ**	**0.74 J**	**100 UJ**	**36.5**	**100 UJ**	**34.5**	**100 UJ**	**6.5 J**	**100 UJ**
Beryllium	1.0	2.5 U	4.0	4.1	1.0 U	2.5 U	1.0 U	2.5 U	1.0 U	2.5 U	2.0	2.5 U
Cadmium*	13.4	13.1	4.9	3.9	13	13.3	0.69 J-	2.5 U	3.0	3.1	3.4	3.7
Calcium	72900	73000	**440000**	**362000**	5030	5050	31100	30000	31100	29700	162000	147000
Chromium	2.0 U	1.0 J-	2.0 U	3.3 J-	2.0 U	0.7 J-	2.0 U	5.0 U	2.0 U	5.0 U	2.0 U	5.0 U
Cobalt	18.1 J	17.5 J	123 J	137	26.8 J	29.8	6.1 J	6.2 J	8.4 J	6.9 J	22.9 J	22.8 J
Copper*	306	330	19	7.2 J	110	118	19.7	23.1	149	159	31.7	44.6
Iron*	**6100**	**9350**	139000	133000	**16900**	**23700**	**276**	**550**	**1780**	**2900**	**11700**	**17800**
Lead*	13.7	16.6 J	3.7	4.0 J-	2.0	5.0 UJ	29.7	33.6 J	55.1	65 J	1.0 U	13.1 J
Magnesium	6680	6740	30900	27500	10900	10800	4410 J	4270	4490 J	4290	8990	8190
Manganese*	5650 R	5890	41200	39000	821 R	922	381 R	402	386 R	387	2350 R	2400
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	11.1	11.4 J	60.7	61.5	14.6	15.9 J	5.6	6.1 J	6.6	6.8 J	12.7	12.5 J
Potassium	674 J	664 J	2150 J	2090 J	1340 J	1410 J	653 J	653 J	606 J	648 J	1130 J	1110 J
Selenium	5.0 U	17.5 U	5.0 U	17.5 U	5.0 U	1.6 J	5.0 U	17.5 U	5.0 U	17.5 U	5.0 U	17.5 U
Silver	1.0 U	5.0 U	1.0 U	5.0 UJ	1.0 U	5.0 U	1.0 U	5.0 U	1.0 U	5.0 U	1.0 U	5.0 UJ
Sodium	10900	11200	50300	49500	5120	5130	**1640 J**	**1280 J**	2560 J	2510	5770	5420
Thallium	1.0 U	12.5 U	1.0 UJ	12.5 UJ	1.0 U	12.5 U	1.0 U	12.5 U	1.0 U	12.5 U	1.0 UJ	12.5 U
Vanadium	1.0 U	25 U	1.0 U	25 U	1.0 U	1.9 J	1.0 U	25 U	1.0 U	25 U	1.0 U	25 U
Zinc*	3580	3820	17300	15600	1010	1150	176	201	621	681	1040	1110

* Chemical of Concern
Bold indicates a greater than 20% difference between total and dissolved results
R Reported value is "rejected". Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
J The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
J- The associated numerical value is an estimated quantity because the Quality Control criteria were not met. The result may be biased low.
UJ The reported quantitation limit is estimated because Quality Control criteria were not met. The element or compound was not detected.
U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

TABLE 4
July 2005 Dissolved and Total Metals Sample Results Comparison
Concentrations in µg/L
(continued)

Sample ID	GTSW07		GTSW08		GTSW09		GTSW10		GTSW11	
Sample Location	Red & Bonita		Upper Gold King (7th Level)		Mogul		Grand Mogul		North Fork at Cement Creek Confluence	
	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Field Parameters										
Flow rate (gpm)	210		42		21		110		380	
pH (S.U.)	3.08		2.64		3.11		3.05		2.5	
Temperature (°C)	9		9.1		7.1		16.9		4.1	
Conductivity (mS/cm)	1.45		3.44		1.39		0.49		1.16	
Analyte										
Aluminum*	3800	3570	64800	56600	8690	8210	4840	4890	16600	16000
Antimony	2.0 U	30 U	2.0 U	30 U	2.0 U	30 U	2.0 U	30 U	2.0 U	30 U
Arsenic	1.1	5.0 U	15.3	16.6	2.4	3.0 J	1.5	2.1 J	3.4	1.7 J
Barium	**7.5 J**	**100 UJ**	**1.8 J**	**100 UJ**	**13.3**	**100 UJ**	14.7	18.4 J-	9.0 J	10.9 J-
Beryllium	3.4	3.7	17.4	15.8	9.2	9.5	1.0 U	2.5 U	3.3	3.5
Cadmium*	27	25.8	169	156	201	204	50.5	56.2	43.5	43.1
Calcium	245000	213000	**377000**	**287000**	213000	188000	14300	14000	90700	81800
Chromium	2.0 U	2.3 J-	15.2	19.8	2.0 U	3.1 J-	2.0 U	1.4 J-	**5.2**	**6.3**
Cobalt	68.1 J	73.4	167 J	190	37.7 J	40.2	8.3 J	7.0 J	43.9 J	46.1
Copper*	87.2	94	8940	10700	193	209	1770	1730	2450	2380
Iron*	47200	43200	**204000**	**169000**	**31800**	**47400**	9590	9360	46500	42000
Lead*	72	67.8 J	9.5	2.3 J-	313	311 J	30.6	29.4 J	2.1	1.7 J-
Magnesium	18600	16700	**41700**	**34100**	13500	12200	4170 J	3940	12500	11000
Manganese*	23000	20500	49300	52000	28700	26000	3840 R	3990	9600 R	8990
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	31	31.4	97	106	22.7	23.2	6.2	6.1 J	27.3	26.4
Potassium	1400 J	1360 J	1150 J	1020 J	2010 J	1960 J	593 J	542 J	371 J	382 J
Selenium	5.0 U	17.5 U	0.76 J	3.1 J	5.0 U	17.5 U	5.0 U	17.5 U	0.82 J	17.5 U
Silver	1.0 U	5.0 UJ	1.0 U	5.0 UJ	1.0 U	5.0 UJ	1.0 U	5.0 U	1.0 U	5.0 U
Sodium	32800	31000	115000	104000	146000	139000	25100	24600	23600	22000
Thallium	1.0 UJ	12.5 UJ	1.0 UJ	12.5 UJ	1.0 UJ	12.5 UJ	1.0 U	12.5 UJ	1.0 U	12.5 U
Vanadium	1.0 U	25 U	4.2	2.2 J	1.0 U	25 U	1.0 U	25 U	1.0 U	25 U
Zinc*	10400	10100	**41000**	**32900**	**56000**	**44500**	9540	9830	8470	8350

* Chemical of Concern
Bold indicates a greater than 20% difference between total and dissolved results
R Reported value is "rejected". Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
J The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
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UJ The reported quantitation limit is estimated because Quality Control criteria were not met. The element or compound was not detected.
U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

TABLE 5
July 2005 Duplicate Sample Results Comparison
Concentrations in µg/l

Sample ID	GTSW01D	GTSW12D		GTSW01	GTSW12	
Analysis	Dissolved Metals			Total Metals and Other Analytes		
Sample Location	Cement Creek downstream of American Tunnel	GTSW01D Duplicate	Relative Percent Difference	Cement Creek downstream of American Tunnel	GTSW01 Duplicate	Relative Percent Difference
Analyte						
Aluminum*	3670	3900	6.1	3830	3830	0.0
Antimony	2.0 U	2.0 U	NC	30 U	30 U	NC
Arsenic	1.0 U	1.0 U	NC	5.0 U	5.0 U	NC
Barium	18.5	18.4	0.5	100 UJ	22.4 J-	126.8
Beryllium	1.0	1.0	0.0	2.5 U	2.5 U	NC
Cadmium*	13.4	13.2	1.5	13.1	13.8	5.2
Calcium	72900	78800	7.8	73000	71800	1.7
Chromium	2.0 U	2.0 U	NC	1.0 J-	1.1 J-	9.5
Cobalt	18.1 J	18.2 J	0.6	17.5 J	17.1 J	2.3
Copper*	306	313	2.3	330	321	2.8
Iron*	6100	6420	5.1	9350	8910	4.8
Lead*	13.7	13.5	1.5	16.6 J	14.4 J	14.2
Magnesium	6680	7210	7.6	6740	6450	4.4
Manganese*	5650 R	5670 R	0.4	5890	5640	4.3
Mercury	0.20 U	0.20 U	NC	0.20 U	0.20 U	NC
Nickel	11.1	11.5	3.5	11.4 J	10.7 J	6.3
Potassium	674 J	683 J	1.3	664 J	655 J	1.4
Selenium	5.0 U	5.0 U	NC	17.5 U	17.5 U	NC
Silver	1.0 U	1.0 U	NC	5.0 U	5.0 U	NC
Sodium	10900	11500	5.4	11200	10500	6.5
Thallium	1.0 U	1.0 U	NC	12.5 U	12.5 U	NC
Vanadium	1.0 U	1.0 U	NC	25 U	25 U	NC
Zinc*	3580	3640	1.7	3820	3710	2.9
Acidity as $CaCO^3$ (mg/l)				63	68	7.6
Acidity as $CaCO^3$ (mq/l)				1.3	1.4	7.4
Alkalinity Bicarbonate as HCO^3 (mg/l)				1 U	1 U	NC
Alkalinity Carbonate as CO^3 (mg/l)				0	0	NC
Alkalinity Total as $CaCO^3$ (mg/l)				1 U	1 U	NC
Chloride as Cl (mg/l)				1 U	1 U	NC
Fluoride (undistilled) (mg/l)				1.1	1.37	21.9
Sulfate as SO^4 (mg/l)				277	279	0.7
Nitrate +Nitrite as N (mg/l)				0.11	0.1	9.5

* Chemical of Concern
R Reported value is "rejected". Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
J The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
J- The associated numerical value is an estimated quantity because the Quality Control criteria were not met. The result may be biased low.
U The material was analyzed for, but was not detected above the level of the associated value.
The associated value is either the sample quantitation limit or the sample detection limit.
NC Not Calculated because one or both values were reported below laboratory detection limits.

TABLE 6
July 2005 Dissolved Metals Results - Comparison with Historic Data
Concentrations in µg/L

Sample ID	GTSW01D		GTSW02D		GTSW03D		GTSW04D		GTSW05D		GTSW06D	
Sample Location	Cement Creek downstream of Am. Tunnel July 2005 Data	Cement Creek at Gladstone (CC18) 7/8/97	American Tunnel July 2005 Data	American Tunnel (AT-INFEL) 11/05/02	Eveline July 2005 Data	Eveline avg. of four data pts (1996-97)	Upper Prospect Gulch	Upper Prospect Gulch (PG45) 6/30/99	Lower Prospect Gulch	Lower Prospect Gulch (PG860) 6/30/99	Silver Ledge July 2005 Data	Silver Ledge avg. of six data pts (1996-98)
Latitude	37.890735		37.89095		37.88826		37.89169		37.89281		37.87666	
Longitude	107.64998		107.64826		107.66512		-107.67909		-107.68114		107.64454	
Field Parameters												
Flow rate (gpm)	4200	5640	95	285	4	6.3	510	NA	600	NA	630	384
pH (S.U)	3.46	3.0	4.3	5.9	3.0	3.2	4.53	6.2	3.51	3.87	5.3	5.9
Temperature (°C)	9.8	5.5	7.9	12.3	6.9	NA	12.4	7.2	12.3	4.6	5.9	NA
Conductivity (mS/cm)	0.57	0.23	2.41	2.0	0.63	0.45	0.25	0.091	0.3	0.235	0.81	0.84
Analyte												
Aluminum*	3670	2840	**7670**	3120	12600	9800	**2410**	66	**2470**	1215	1960	1120
Cadmium*	13.4	10	4.9	8	13	7.4	0.69	<2	3.0	<2	3.4	5
Copper*	306	330	19	20	110	76	19.7	10	149	193	**31.7**	12
Iron*	6100	7960	139000	98700	16900	14300	**276**	<30	1780	2457	11700	13600
Lead*	13.7	7	*3.7*	29	*2.0*	8.8	29.7	<30	55.1	<30	*1.0*	12
Manganese*	**5650 R**	880	41200	37000	821 R	788	**381R**	110	**386 R**	167	2350 R	2500
Zinc*	3580	2240	17300	15000	1010	810	176	179	621	500	1040	812
Sulfate as SO_4 (mg/L)	**277**	96	1820	1880	194	174	**112**	34	**124**	51	487	519

* Chemical of Concern
1 Sunnyside Gold September 2, 2005 letter to Colorado Division of Mining and Geology
Historic Values 1) September 1998 Reclamation Feasibility Report, Colorado Division of Mining and Geology
2) 5/24/04 Mine Inventory and Compilation of Mine-Adit Chemistry Data, USGS
R Rejected during data validation
Bold indicates a July 2005 value 200 % greater than the historic value
Italics indicates a July 2005 value less than 50 % of the historic value

TABLE 6
July 2005 Dissolved Metals Results - Comparison with Historic Data
Concentrations in µg/L
(continued)

Sample ID / Sample Location	GTSW07D Red & Bonita July 2005 Data	Red and Bonita 6/25/97	GTSW08D Upper Gold King (7th Level) July 2005 Data	"Pre-bulkhead" Gold King 7 sample average [1]	Gold King (GK) 7/9/01 sample [1]	GTSW09D Mogul July 2005 Data	Mogul avg. of two data pts. (1996-99)	GTSW10D Grand Mogul July 2005 Data	Grand Mogul avg. five data pts. (1996-99)	GTSW11D North Fork at Cement Creek Confl. July 2005 Data	North Fork (CC12) at high flow 6/25/97
Latitude	37.89678		37.89458			37.90983		37.91015		37.89513	
Longitude	107.64487		107.63837			107.63846		107.63225		107.64676	
Field Parameters											
Flow rate (gpm)	**210**	6	42	NA	38	21	9	**110**	17	380	539
pH (S.U)	3.1	3.0	2.6	NA	NA	3.1	2.9	3.1	3.2	2.5	2.7
Temperature (°C)	9.0	NA	9.1	NA	NA	7.1	NA	16.9	NA	4.1	NA
Conductivity (mS/cm)	1.45	0.88	3.44	NA	NA	1.39	0.94	0.49	0.48	1.16	0.612
Analyte											
Aluminum*	*3800*	11000	64800	360000	78000	*8690*	26000	4840	7900	16600	15000
Cadmium*	*27*	97	169	605	210	*201*	880	50.5	92	43.5	38
Copper*	*87.2*	1400	8940	67700	13200	*193*	9300	1770	3200	2450	2300
Iron*	47200	39000	204000	1462000	291000	*31800*	89000	9590	15000	46500	66000
Lead*	72	110	*9.5*	166	40	**313**	121	30.6	37	2.1	3.7
Manganese*	23000	26000	49300	87000	28000	28700	20400	3840 R	6700	**9600 R**	2100
Zinc*	10400	18000	41000	216000	46000	56000	64500	9540	17000	8470	8000
Sulfate as SO4 (mg/l)	878	560	2330	NA	NA	859	450	149	190	530	NA

* Chemical of Concern
1 Sunnyside Gold September 2, 2005 letter to Colorado Division of Mining and Geology
Historic Values 1) September 1998 Reclamation Feasibility Report, Colorado Division of Mining and Geology
2 5/24/04 Mine Inventory and Compilation of Mine-Adit Chemistry Data, USGS
R Rejected during data validation
NA Not available
Bold indicates a July 2005 value 200 % greater than the historic value
Italics indicates a July 2005 value less than 50 % of the historic value

TABLE 7
July 2005 Dissolved Metals Loading Calculations
Concentrations in µg/L

Sample ID	GTSW01D		GTSW02D		GTSW03D		GTSW04D	GTSW05D		
Sample Location / Analyte	Cement Creek downstream of Am. Tunnel Sample Results	% of Cement Creek accounted for by Mogul, American Tunnel, Red and Bonita, and Upper Gold King 7th Level	American Tunnel Sample Results	% of Upper Cement Creek accounted for by American Tunnel	Eveline Sample Results	Ratio of Eveline to Upper Cement Creek	Upper Prospect Gulch Sample Results	Lower Prospect Gulch Sample Results	% increase of Lower to Upper	Ratio of (Lower PG - Upper PG) to Upper Cement Creek
Flow rate (gpm)	4200		95		4		510	600		
Flow rate (lpm)	16000	8.7	360	2.2	15	0.00095	1930	2300		0.023
Aluminum*	3670		7670		12600		2410	2470		
Mass Al (lbs/day)	190	28	8.8	4.6	0.61	0.0032	15	18	22	0.017
Cadmium*	13.4		4.9		13		0.69	3		
Mass Cd (lbs/day)	0.68	31	0.0056	0.82	0.00062	0.00092	0.0042	0.022	420	0.026
Calcium	72900		440000		5030		31100	31100		
Mass Ca (lbs/day)	3700	37	500	14	0.24	0.00007	190	230	21	0.0108
Copper*	306		19		110		19.7	149		
Mass Cu (lbs/day)	16	31	0.022	0.14	0.0053	0.00034	0.12	1.1	800	0.062
Iron*	6100		139000		16900		276	1780		
Mass Fe (lbs/day)	310	**130**	160	52	0.81	0.0026	1.7	13	660	0.036
Lead*	14		3.7		2		29.7	55.1		
Mass Pb (lbs/day)	0.70	39	0.0042	0.61	0.00010	0.00014	0.18	0.40	120	0.32
Magnesium	6680		30900		10900		4410	4490		
Mass Mg (lbs/day)	340	31	35	10	0.52	0.0015	27	33	21	0.017
Manganese*	*5650*		41200		*821*		*381*	*386*		
Mass Mn (lbs/day)	290	47	47	16	0.039	0.00014	2.3	2.8	22	0.0017
Potassium	674		2150		1340		653	606		
Mass K (lbs/day)	34	21	2.5	7.2	0.064	0.0019	4.0	4.4	10.6	0.012
Sodium	10900		50300		5120		1640	2560		
Mass Na (lbs/day)	554	42	57	10	0.25	0.00044	10	19	86	0.016
Zinc*	3580		17300		1010		176	621		
Mass Zn (lbs/day)	180	45	20	11	0.049	0.00027	1.1	4.5	310	0.019

* Chemical of Concern

Italics indicates Manganese results that were rejected during the data validation.

TABLE 7
July 2005 Dissolved Metals Loading Calculations
Concentrations in µg/L
(continued)

Sample ID	GTSW06D		GTSW07D		GTSW08D		GTSW09D		GTSW10D		GTSW11D		
Sample Location	Silver Ledge Sample Results	Ratio of Silver Ledge to Upper Cement Creek	Red and Bonita Sample Results	% of Upper Cement Creek accounted for by Red & Bonita	Upper Gold King (7th Level) Sample Results	% of Upper Cement Creek accounted for by Upper Gold King	Mogul Sample Results	% of Upper Cement Creek accounted for by Mogul	Grand Mogul Sample Results	% of Upper Cement Creek accounted for by Grand Mogul	North Fork at Cement Creek Confl. Sample Results	% of Upper Cement Creek accounted for by North Fork	% of North Fork accounted for by Upper Gold King (use only 29 gpm) [1]
Flow rate (gpm)	630		210		42		21		110		380		
Flow rate (lpm)	2400	0.15	790	4.9	160	1.0	79	0.50	420	2.6	1400	8.8	7.6
Analyte													
Aluminum*	1960		3800		64800		8690		4840		16600		
Mass Al (lbs/day)	15	0.079	9.5	5.0	33	17	2.2	1.2	6.5	3.4	74	39	31
Cadmium*	3.4		27		169		201		50.5		43.5		
Mass Cd (lbs/day)	0.026	0.038	0.068	10	0.086	13	0.051	7.5	0.067	10	0.19	28	31
Calcium	162000		245000		377000		213000		14300		90700		
Mass Ca (lbs/day)	1200	0.32	610	16	190	5.1	54	1.5	19	0.52	400	11	33
Copper*	31.7		87.2		8940		193		1770		2450		
Mass Cu (lbs/day)	0.24	0.016	0.22	1.4	4.5	29	0.049	0.31	2.4	15	11	70	29
Iron*	11700		47200		204000		31800		9590		46500		
Mass Fe (lbs/day)	89	0.29	120	39	100	32	8.0	2.6	13	4.1	210	68	33
Lead*	1.0		72		9.5		313		30.6		2.1		
Mass Pb (lbs/day)	0.0076	0.011	0.18	26	0.0048	0.7	0.079	11	0.041	5.9	0.009	1.3	36
Magnesium	8990		18600		41700		13500		4170		12500		
Mass Mg (lbs/day)	69	0.20	47	14	21	6.2	3.4	1.0	5.6	1.6	56	16	26
Manganese*	*2350*		23000		49300		28700		*3840*		*9600*		
Mass Mn (lbs/day)	18	0.062	58	20	25	8.6	7.2	2.5	5.1	1.8	43	15	40
Potassium	1130		1400		1150		2010		593		371		
Mass K (lbs/day)	8.6	0.25	3.5	10	0.58	1.7	0.51	1.5	0.79	2.3	1.6	4.8	24
Sodium	5770		32800		115000		146000		25100		23600		
Mass Na (lbs/day)	44	0.079	82	15	58	11	37	6.7	33	6.0	100	18	40
Zinc*	1040		10400		41000		56000		9540		8470		
Mass Zn (lbs/day)	7.9	0.044	26	15	21	12	14	7.8	13	7.1	38	21	38

* Chemical of Concern

Italics indicates Manganese results that were rejected during the data validation.

TABLE 8
July 2005 Weighted Average Metals Concentrations for Three Adits/Tunnel Discharge Compared to Cement Creek Concentrations in µg/L

Sample ID	GTSW02D	GTSW07D	GTSW08D	GTSW09D	Total Flow from four adits/tunnel and Average Concentrations	GTSW01D
Sample Location	**American Tunnel**	**Red and Bonita**	**Upper Gold King (7th Level)**	**Mogul**		**Cement Creek downstream of American Tunnel**
Field Parameters						
Flow rate (gpm)	95	210	42	21	370	4200
pH (S.U.)	4.27	3.08	2.64	3.11	3.27	3.46
Temperature (°F)	7.9	9	9.1	7.1	9	9.8
Conductivity (mS/cm)	2.41	1.45	3.44	1.39	1.9	0.57
Analyte						
Aluminum*	7670	3800	64800	8690	11970	3670
Cadmium*	4.9	27	169	201	50	13.4
Copper*	19	87.2	8940	193	1080	306
Iron*	139000	47200	204000	31800	87400	6100
Lead*	3.7	72	9.5	313	61	13.7
Manganese*	41200	23000	49300	28700	30900	*5650*
Zinc*	17300	10400	41000	56000	18000	3580

* Chemical of Concern

Italics indicates Manganese results that were rejected during the data validation.

TABLE 9
July 2005 Calculated Metals Loads and Concentrations at CC48 and A72 Using Two Water Treatment Alternatives at Gladstone

	CC48			Alternative 1 [1]			Alternative 2 [1]		
CC48 Flow rate	7/7/2004 sample data	8/19/2004 sample data	Extrapolated values for 7/21/04	Metals removed (lbs/yr) [1]	Resulting CC48 metal concentrations	Percent metal load reduction at CC48	Metals removed (lbs/yr) [1]	Resulting CC48 metal concentrations	Percent metal load reduction at CC48
Flow rate (cubic feet/second)	42	15	33						
Flow rate (liters/year)	3.75E+10	1.34E+10	2.96E+10						
Dissolved Metal Concentrations (µg/L) and Loads (pounds/yr)									
Aluminum Concentration	2936	6119	3970		3700			3700	
Aluminum Load	240000	180000	260000	19000		7	18000		7
Cadmium Concentration	4.51	7.64	5.53		4.29			4.54	
Cadmium Load	370	230	360	80		20	64		18
Copper Concentration	65.2	114.5	81		55			58	
Copper Load	5400	3400	5300	1700		32	1500		28
Iron Concentration	4891	8084	5929		3800			5500	
Iron Load	400000	240000	390000	140000		36	32000		7
Manganese Concentration	1816	2768	2125		1800			2125	
Manganese Load	150000	82000	140000	20000		15	-8300		0
Zinc Concentration	971	1724	1216		770			940	
Zinc Load	80000	51000	79000	29000		37	18000		23

1- Assume treatment to pH = 9.0 and resulting dissolved metal concentrations from CEMI report
Lead data is unavailable for CC48 and A72
Alternative 1 = Mogul, Red & Bonita, Gold King Level 7, and American Tunnel
Alternative 2 = Upper Cement Creek 1200 gpm treated
Assumptions: 1. Conservation of mass;
2. Change in Cement Creek water chemistry at Gladstone has no beneficial or detrimental over the remainder of the distance to A72.
3. Conditions at CC48 and A72 were comparable in 2004 to those in 2005.
4. Adit and Cement Creek flow rates and water chemistry are unchanged between 2004 and 2005
5. Changes in CC48 and A72 flow rates and water chemistry are linear between 7/7/04 and 8/19/04

TABLE 9
July 2005 Calculated Metals Loads and Concentrations at CC48 and A72 Using Two Water Treatment Alternatives at Gladstone
(continued)

				Alternative 1 [1]			Alternative 2 [1]		
	A72								
A72 Flow rate	7/7/2004 sample data	8/19/2004 sample data	Extrapolated values for 7/21/04	Metals removed (lbs/yr)[1]	Resulting A72 metal concentrations	Percent metal load reduction at A72	Metals removed (lbs/yr) [1]	Resulting A72 metal concentrations	Percent metal load reduction at A72
Flow rate (cubic feet/second)	439	108	331						
Flow rate (liters/year)	3.91E+11	9.63E+10	2.96E+11						
Dissolved Metal Concentrations (µg/L) and Loads (pounds/yr)									
Aluminum Concentration	639.5	1701	985		950			960	
Aluminum Load	550000	360000	640000	19000		3.0	18000		2.8
Cadmium Concentration	0.50	2.42	1.13		1.00			1.02	
Cadmium Load	430	510	730	80		10.9	64		8.8
Copper Concentration	3.65	7.5	4.90		2.3			2.6	
Copper Load	3200	1600	3200	1700		53	1500		47
Iron Concentration	1409	2302	1700		1500			1600	
Iron Load	1200000	490000	1100000	140000		13	32000		2.9
Manganese Concentration	473.7	1089	674		650			674	
Manganese Load	410000	230000	440000	20000		4.5	-8300		0
Zinc Concentration	284	553	372		320			340	
Zinc Load	250000	120000	240000	29000		12	18000		7.5

1- Assume treatment to pH = 9.0 and resulting dissolved metal concentrations from CEMI report
Lead data is unavailable for CC48 and A72
Alternative 1 = Mogul, Red & Bonita, Gold King Level 7, and American Tunnel
Alternative 2 = Upper Cement Creek 1200 gpm treated
Assumptions: 1. Conservation of mass;
2. Change in Cement Creek water chemistry at Gladstone has no beneficial or detrimental over the remainder of the distance to A72.
3. Conditions at CC48 and A72 were comparable in 2004 to those in 2005.
4. Adit and Cement Creek flow rates and water chemistry are unchanged between 2004 and 2005
5. Changes in CC48 and A72 flow rates and water chemistry are linear between 7/7/04 and 8/19/04

TABLE 10
September 2005 Dissolved Metals Sample Results
Concentrations in µg/L

Sample ID	GTSW01D	GTSW02D	GTSW03D	GTSW04D	GTSW05D	GTSW06D	GTSW07D	GTSW08D	GTSW09D	GTSW10D	GTSW11D	GTSW12D	GTSW13D	GTSW14D	GTSW15D
EPA Sample ID	MH1G41	MH1G43	MH1G45	MH1G47	MH1G49	MH1G51	MH1G53	MH1G55	MH1G57	MH1GH59	MH1G61	MH1G63	MH1G65	MH1G67	MH1G69
Sample Location	Cement Creek downstream of American Tunnel	American Tunnel	Eveline	Lark	Joe and John	Silver Ledge	Red & Bonita	Upper Gold King(7th Level)	Mogul	Grand Mogul	North Fork at Cement Creek Confl.	Gold Point	Black Hawk	Big Colorado	GTSW01D Duplicate
Latitude	37.89073494	37.8909479	37.8882571	37.89169	37.89281	37.87665971	37.89678128	37.89457925	37.90982715	37.9101484	37.89512604	37.90828	37.88207	37.87688	
Longitude	-107.6499827	-107.648261	-107.6651764	-107.67909	-107.68114	-107.6445387	-107.6448654	-107.6383657	-107.638459	-107.632253	-107.6467579	-107.6379	-107.63492	-107.64599	
Flow rate gpm (Measmnt method)	1150 (1)	90 (2)	4 (3)	1 (5)	1 (5)	585 (4)	224 (2)	135 (2)	27 (2)	0.5 (2)	149 (2)	27 (2)	358 (2)	18 (2)	
Field Parameters															
pH (S.U.)	3.24	4.8	3.15	2.21	2.5	6.01	3.72	2.89	2.85	2.75	2.72	6.19	6.72	4.17	
Temperature (°C)	7.3	8.3	5.3	8.9	5.1	6.2	12.3	9.1	5.7	3.2	9.1	4.1	8.4	7.1	
Conductivity (mS/cm)	1.36	2.46	0.46	2.6	1.1	0.96	1.57	2.97	1.51	1.07	2.5	0.47	1.52	0.79	
Aluminum*	11500	7570	12200	41900	14500	1000	3400	42400	8150	11900	39300	898	362	6880	11100
Antimony	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	4 U	2 U	2 U	2 U
Arsenic	1 U	1 U	1 U	89.2	45.5	1 U	1.1	6.6	2.5	7.5	4.6	4.3	1 U	5.2	1 U
Barium	16.6 J	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	13.9 J	10 UJ	10 UJ	10 UJ	13.5 J	10 UJ	17.8 J
Beryllium	4.1 J	4.1 J	1 UJ	1 J	1 UJ	1.4 J	4 J	22.1 J	9.3 J	1 UJ	16 J	1 UJ	1 UJ	1.3 J	4.5 J
Cadmium*	35.2	4.8	11.9	128	51.8	1.7	24.4	128	192	133	112	1 J	2.1	6.6	36.7
Calcium	199000	452000	5000	23400	5000 U	195000	255000	391000	222000	20000	290000	83800	344000	101000	194000
Chromium	2 U	2 U	2 U	13.4	4.3	2 U	2 U	6.5	2 U	3.2	8	2 U	2 U	2 U	2 U
Cobalt	58.6	128	27.9	116	36	16.8	77.1	178	38.6	22.9	144	8.9	11.9	49.5	60.9
Copper*	1110	18.6	49.5	6490	584	5.2	64.3	7860	79.2	5280	6490	5.3	2.6	25.4	1190
Iron*	34200	140000	13000	314000	54800	8050	37700	139000	31600	38100	93400	5220	100 U	59000	33300
Lead*	25.9 J	3.2 J	1.6 J	434 J	384 J	1 UJ	55.5 J	43.8 J	313 J	2.5 J	19.8 J	1 UJ	1 UJ	1 J	27.3 J
Magnesium	15700	30800	10700	15400	5000 U	8820	18400	34800	13900	9730	29700	5000 U	14300	11900	15200
Manganese*	20400 J	46200 J	780 J	1540 J	414 J	2340 J	25700 J	84200 J	34300 J	10400 J	52800 J	1410 J	5660 J	1960 J	21300 J
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	32.4	65.3	14.9	97.4	25.5	10.9	37.8	100	25	14.3	81.5	5.9	8.8	32.2	34.3
Potassium	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U
Selenium	5 U	5 U	5 U	1.5 J	5 U	5 U	5 U	0.64 J	5 U	5 U	0.98 J	10 U	5 U	5 U	5 U
Silver	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U
Sodium	5100	9970	2570 J-	2590 J	429 J-	3730 J-	7130	7270	8260	2160 J	5980	3970 J	4630 J+	4260 J	5120
Thallium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U
Vanadium	1 U	1 U	1 U	1.1	3.9	1 U	1 U	3.9	1 U	1 U	1.9	1 U	1 U	1 U	1 U
Zinc*	11500 J	16900 J	906 J	33900 J	11200 J	679 J	11500 J	46800 J	51100 J	25000 J	30900 J	881 J	927 J	871 J	12000 J

* Chemical of Concern

Flow rate Measurement Methods 1- Marsh McBirney; 2 - Flume; 3- Five-gallon bucket; 4- Culvert/Marsh McBirney; 5- Visual estimate

Data Qualifiers

J The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
J- The associated numerical value is an estimated quantity because the Quality Control criteria were not met. The result may be biased low.
J+ The associated numerical value is an estimated quantity but the result may be biased high.
UJ The reported quantitation limit is estimated because Quality Control criteria were not met. The element or compound was not detected.
U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

TABLE 11
September 2005 Total Metals and Water Treatment Parameter Sample Results
Concentrations in µg/L

Sample ID	GTSW	GTSW02	GTSW03	GTSW04	GTSW05	GTSW06	GTSW07	GTSW08	GTSW09	GTSW10	GTSW11	GTSW12	GTSW13	GTSW14	GTSW15
EPA Sample ID	MH1G40	MH1G42	MH1G44	MH1G46	MH1G48	MH1G50	MH1G52	MH1G54	MH1G56	MH1G58	MH1G60	MH1G62	MH1G64	MH1G66	MH1G68
Sample Location	Cement Creek downstream of American Tunnel	American Tunnel	Eveline	Lark	Joe and John	Silver Ledge	Red and Bonita	Upper Gold King (7th Level)	Mogul	Grand Mogul	North Fork at Cement Creek Confluence	Gold Point	Black Hawk	Big Colorado	GTSW01D Duplicate
Flow rate (gpm)	1150	90	4	1	1	585	224	135	27	0.5	149	27	358	18	
Analyte															
Aluminum*	11400 J	7670 J	12100 J	40400 J	14400 J	1400 J	3420 J	40200 J	7790 J	11800 J	38300 J	1090 J	679 J	7000 J	11000 J
Antimony	2 U	2 U	2 U	2 U	0.78 J	2 U	2 U	1.3 J	2 U	2 U	2 U	1.7 J	2 U	2 U	2 U
Arsenic	1.3	1.5	0.76 J	87	47.3	2.5	1.8	14.7	4.7	10.8	4.8	17.1	2.6	9.3	1.6
Barium	17.6 J	8.7 J	0.68 J	10 J	3.8 J	9.6 J	8.6 J	8 J	13.4 J	4.3 J	5.4 J	4.6 J	13.4 J	3.5 J	17.8 J
Beryllium	4.4	3.8	1 U	1.1	1 U	1.6	4	22.3	9.2	1 U	15.3	1 U	1 U	1.3	4.4
Cadmium*	36.8	4.5	11.5	123	52.3	1.8	23.7	128	184	135	109	1.4	2.2	6.4	37.3
Calcium	194000	434000	5030	22900	5000 U	192000	255000	381000	213000	19500	280000	79700	334000	97300	189000
Chromium	2 U	2 U	2 U	13.3	4.1	2 U	2 U	6.8	2 U	3.2	7.7	2 U	2 U	2 U	2 U
Cobalt	59.7	119	25.8	101	35.1	16.2	75.7	180	35.9	22.5	139	7.4	10.1	48.3	60.9
Copper*	1170	23.8	47.7	5750	590	16.1	52.5	7200	77.8	4900	5750	23.1	26.4	26.5	1200
Iron*	34400	137000	19800	307000	54600	14600	55000	145000	48900	37700	90900	9280	3750	61800	33400
Lead*	29.1 J	5.9 J	1.5 J	417 J	386 J	6.1 J	61.1 J	44.4 J	306 J	3.4 J	19 J	8.7 J	6.5 J	2 J	29 J
Magnesium	15400	29500	10700	15100	3030 J	8610	18400	33400	13200	9650	29000	4480 J	14100	11600	15100
Manganese*	21200 J	42200 J	755 J	1450 J	413 J	2270 J	27200 J	81000 J	31700 J	10100 J	50200 J	1450 J	5000 J	1870 J	21500 J
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	33.4	60.1	14.3	86.5	25.4	10.5	37.1	98.6	23.5	14	77	5.3	7.3	32.5	34.5
Potassium	1290 J-	2170 J-	1330 J-	519 J-	1200 J-	1160 J-	1430 J-	2620 J-	1950 J-	459 J-	1510 J-	745 J-	1240 J-	3340 J-	1260 J-
Selenium	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Sodium	6120	9880	2790 J-	3100 J	1080 J-	4250 J-	8140	7840	8690	2550 J-	6330	4030 J-	4820 J-	4580 J-	5590
Thallium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vanadium	1 U	1.6	1	1.3	3.9	1 U	1 U	11.5	1 U	1 U	2	1 U	1 U	7.3	1 U
Zinc*	11300	16200	880	33600	10500	722	10800	47200	57400	28100	30400	932	952	886	11400
Acidity as $CaCO_3$ (mg/l)	178	337	132	1270	324	30	154	726	243	274	643	16	2 U	142	178
Alkalinity Bicarbonate as HCO_3 (mg/l)	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	98	1 U	1 U
Alkalinity Carbonate as CO_3 (mg/l)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alkalinity Total as $CaCO_3$ (mg/l)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	80	1.0 U	1.0 U
Chloride as Cl (mg/l)	1	1 U	1 U	1 U	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Fluoride (undistilled) (mg/l)	3.53	3.09	0.55	0.32	0.31	2.33	4.56	1.45	11	3.00	10	5.09	2.87	6.75	4.12
Sulfate as SO_4 (mg/l)	821	1850	197	1530	364	567	999	3210	954	409	1730	251	914	466	826
Nitrate +Nitrite as N (mg/l)	0.14	0.03	0.01 U	0.29	0.06	0.01	0.12	0.15	0.1	0.17	0.07	0.01 U	0.01 U	0.17	0.05

* Chemical of Concern
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J- The associated numerical value is an estimated quantity because the Quality Control criteria were not met. The result may be biased low.
UJ The reported quantitation limit is estimated because Quality Control criteria were not met. The element or compound was not detected.
U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

TABLE 12
September 2005 Dissolved and Total Metals Sample Results Comparison
Concentrations in µg/L

Sample ID	GTSW01		GTSW02		GTSW03		GTSW04		GTSW05		GTSW06		GTSW07		GTSW08	
Sample Location	Cement Creek downstream of American Tunnel		American Tunnel		Eveline		Lark		Joe and John		Silver Ledge		Red & Bonita		U. Gold King(7th Level)	
	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Flow rate (gpm)	1150		90		4		1		1		585		224		135	
Field Parameters																
pH (S.U.)	3.24		4.8		3.15		2.21		2.5		6.01		3.72		2.89	
Temperature (°C)	7.3		8.3		5.3		8.9		5.1		6.2		12.3		9.1	
Conductivity (mS/cm)	1.36		2.46		0.46		2.6		1.1		0.96		1.57		2.97	
Analyte																
Aluminum*	11500	11400 J	7570	7670 J	12200	12100 J	41900	40400 J	14500	14400 J	**1000**	**1400 J**	3400	3420 J	42400	40200 J
Antimony	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	0.78 J	2 U	2 U	2 U	2 U	2 U	1.3 J
Arsenic	1 U	1.3	1 U	1.5	1 U	0.76 J	89.2	87	45.5	47.3	1 U	2.5	1.1	1.8	**6.6**	**14.7**
Barium	16.6 J	17.6 J	10 UJ	8.7 J	10 UJ	0.68 J	10 UJ	10 J	10 UJ	3.8 J	10 UJ	9.6 J	10 UJ	8.6 J	10 UJ	8 J
Beryllium	4.1 J	4.4	4.1 J	3.8	1 UJ	0.1 U	1 J	1.1	1 UJ	1 U	1.4 J	1.6	4 J	4	22.1 J	22.3
Cadmium*	35.2	36.8	4.8	4.5	11.9	11.5	128	123	51.8	52.3	1.7	1.8	24.4	23.7	128	128
Calcium	199000	194000	452000	434000	5000 J	5030	23400	22900	5000 U	5000 U	195000	192000	255000	255000	391000	381000
Chromium	2 U	2 U	2 U	2 U	2 U	2 U	13.4	13.3	4.3	4.1	2 U	2 U	2 U	2 U	6.5	6.8
Cobalt	58.6	59.7	128	119	27.9	25.8	116	101	36	35.1	16.8	16.2	77.1	75.7	178	180
Copper*	1110	1170	18.6	23.8	49.5	47.7	6490	5750	584	590	**5.2**	**16.1**	**64.3**	**52.5**	7860	7200
Iron*	34200	34400	140000	137000	**13000**	**19800**	314000	307000	54800	54600	**8050**	**14600**	**37700**	**55000**	139000	145000
Lead*	25.9 J	29.1 J	3.2 J	5.9 J	1.6 J	1.5 J	434 J	417 J	384 J	386 J	1 UJ	6.1 J	55.5 J	61.1 J	43.8 J	44.4 J
Magnesium	15700	15400	30800	29500	10700	10700	15400	15100	5000 U	3030 J	8820	8610	18400	18400	34800	33400
Manganese*	20400 J	21200 J	46200 J	42200 J	780 J	755 J	1540 J	1450 J	414 J	413 J	2340 J	2270 J	25700 J	27200 J	84200 J	81000 J
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	32.4	33.4	65.3	60.1	14.9	14.3	97.4	86.5	25.5	25.4	10.9	10.5	37.8	37.1	100	98.6
Potassium	5000 U	1290 J-	5000 U	2170 J-	5000 U	1330 J-	5000 U	519 J-	5000 U	1200 J-	5000 U	1160 J-	5000 U	1430 J-	5000 U	2620 J-
Selenium	5 U	5 U	5 U	5 U	5 U	5 U	1.5 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.64 J	5 U
Silver	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Sodium	**5100**	**6120**	9970	9880	2570 J-	2790 J	2590 J	3100 J	429 J-	1080 J-	3730 J-	4250 J-	7130	8140	7270	7840
Thallium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	I U	1 U	1 U	1 U
Vanadium	1 U	1 U	1 U	1.6	1 U	1	1.1	1.3	3.9	3.9	1 U	1 U	I U	1 U	**3.9**	**11.5**
Zinc*	11500 J	11300	16900 J	16200	906 J	880	33900 J	33600	11200 J	10500	679 J	722	11500 J	10800	46800 J	47200

* Chemical of Concern
Bold indicates a greater than 20% difference between total and dissolved results
J The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
J- The associated numerical value is an estimated quantity because the Quality Control criteria were not met. The result may be biased low.
UJ The reported quantitation limit is estimated because Quality Control criteria were not met. The element or compound was not detected.
U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

TABLE 12
September 2005 Dissolved and Total Metals Sample Results Comparison
Concentrations in µg/L
(continued)

Sample ID	GTSW09		GTSW10		GTSW11		GTSW12		GTSW13		GTSW14		GTSW15	
Sample Location	Mogul		Grand Mogul		North Fork at Cement Creek Confluence		Gold Point		Black Hawk		Big Colorado		GTSW01 Duplicate	
	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Flow rate (gpm)	27		0.5		149		27		358		18			
Field Parameters														
pH (S.U.)	2.85		2.75		2.72		6.19		6.72		4.17			
Temperature (°F)	5.7		3.2		9.1		4.1		8.4		7.1			
Conductivity (mS/cm)	1.51		1.07		2.5		0.47		1.52		0.79			
Analyte														
Aluminum*	8150	7790 J	11900	11800 J	39300	38300 J	898	1090 J	**362**	**679 J**	6880	7000 J	11100	11000 J
Antimony	2 U	2 U	2 U	2 U	2 U	2 U	4 U	1.7 J	2 U	2 U	2 U	2 U	2 U	2 U
Arsenic	**2.5**	**4.7**	**7.5**	**10.8**	4.6	4.8	**4.3**	**17.1**	1 U	2.6	**5.2**	**9.3**	1 U	1.6
Barium	13.9 J	13.4 J	10 UJ	4.3 J	10 UJ	5.4 J	10 UJ	4.6 J	13.5 J	13.4 J	10 UJ	3.5 J	17.8 J	17.8 J
Beryllium	9.3 J	9.2	1 UJ	1 U	16 J	15.3	1 UJ	1 U	1 UJ	1 U	1.3 J	1.3	4.5 J	4.4
Cadmium*	192	184	133	135	112	109	1 J	1.4	2.1	2.2	6.6	6.4	36.7	37.3
Calcium	222000	213000	20000	19500	290000	280000	83800	79700	344000	334000	101000	97300	194000	189000
Chromium	2 U	2 U	3.2	3.2	8	7.7	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cobalt	38.6	35.9	22.9	22.5	144	139	8.9	7.4	11.9	10.1	49.5	48.3	60.9	60.9
Copper*	79.2	77.8	5280	4900	6490	5750	**5.3**	**23.1**	**2.6**	**26.4**	25.4	26.5	1190	1200
Iron*	**31600**	**48900**	38100	37700	93400	90900	**5220**	**9280**	**100 U**	**3750**	59000	61800	33300	33400
Lead*	313 J	306 J	2.5 J	3.4 J	19.8 J	19 J	1 UJ	8.7 J	1 UJ	6.5 J	1 J	2 J	27.3 J	29 J
Magnesium	13900	13200	9730	9650	29700	29000	5000 U	4480 J	14300	14100	11900	11600	15200	15100
Manganese*	34300 J	31700 J	10400 J	10100 J	52800 J	50200 J	1410 J	1450 J	5660 J	5000 J	1960 J	1870 J	21300 J	21500 J
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	25	23.5	14.3	14	81.5	77	5.9	5.3	**8.8**	**7.3**	32.2	32.5	34.3	34.5
Potassium	5000 U	1950 J-	5000 U	459 J-	5000 U	1510 J-	5000 U	745 J-	5000 U	1240 J-	5000 U	3340 J-	5000 U	1260 J-
Selenium	5 U	5 U	5 U	5 U	0.98 J	5 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver	1 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Sodium	8260	8690	2160 J	2550 J-	5980	6330	3970 J	4030 J-	4630 J+	4820 J-	4260 J	4580 J-	5120	5590
Thallium	1 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vanadium	1 U	1 U	1 U	1 U	1.9	2	1 U	1 U	1 U	1 U	1 U	7.3	1 U	1 U
Zinc*	51100 J	57400	25000 J	28100	30900 J	30400	881 J	932	927 J	952	871 J	886	12000 J	11400

* Chemical of Concern
Bold indicates a greater than 20% difference between total and dissolved results
J The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
J- The associated numerical value is an estimated quantity because the Quality Control criteria were not met. The result may be biased low.
UJ The reported quantitation limit is estimated because Quality Control criteria were not met. The element or compound was not detected.
U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

TABLE 13
September 2005 Duplicate Sample Results Comparison
Concentrations in µg/L

Sample ID	GTSW01D	GTSW12D		GTSW01	GTSW12	
Analysis	Dissolved Metals			Total Metals and Other Analytes		
Sample Location	Cement Creek downstream of American Tunnel	GTSW01D Duplicate	Relative Percent Difference	Cement Creek downstream of American Tunnel	GTSW01 Duplicate	Relative Percent Difference
Analyte						
Aluminum*	11500	11100	3.5	11400 J	11000 J	3.6
Antimony	2 U	2 U	NC	2 U	2 U	NC
Arsenic	1 U	1 U	NC	1.3	1.6	20.7
Barium	16.6 J	17.8 J	7.0	17.6 J	17.8 J	1.1
Beryllium	4.1 J	4.5 J	9.3	4.4	4.4	0.0
Cadmium*	35.2	36.7	4.2	36.8	37.3	1.3
Calcium	199000	194000	2.5	194000	189000	2.6
Chromium	2 U	2 U	NC	2 U	2 U	NC
Cobalt	58.6	60.9	3.8	59.7	60.9	2.0
Copper*	1110	1190	7.0	1170	1200	2.5
Iron*	34200	33300	2.7	34400	33400	2.9
Lead*	25.9 J	27.3 J	5.3	29.1 J	29 J	0.3
Magnesium	15700	15200	3.2	15400	15100	2.0
Manganese*	20400 J	21300 J	4.3	21200 J	21500 J	1.4
Mercury	0.2 U	0.2 U	NC	0.2 U	0.2 U	NC
Nickel	32.4	34.3	5.7	33.4	34.5	3.2
Potassium	5000 U	5000 U	0.0	1290 J-	1260 J-	2.4
Selenium	5 U	5 U	NC	5 U	5 U	NC
Silver	1 U	1 U	NC	1 U	1 U	NC
Thallium	1 U	1 U	NC	1 U	1 U	NC
Vanadium	1 U	1 U	NC	1 U	1 U	NC
Zinc*	11500 J	12000 J	4.3	11300	11400	0.9
Acidity as CaCO3 (mg/l)				178	178	0.0
Alkalinity Bicarbonate as HCO3 (mg/l)				1 U	1 U	NC
Alkalinity Carbonate as CO3 (mg/l)				0.0	0.0	ND
Alkalinity Total as CaCO3 (mg/l)				1.0 U	1.0 U	NC
Chloride as Cl (mg/l)				1	1 U	NC
Fluoride (undistilled) (mg/l)				3.53	4.12	15.4
Sulfate as SO4 (mg/l)				821	826	0.6
Nitrate +Nitrite as N (mg/l)				0.14	0.05	**94.7**

* Chemical of Concern
R Reported value is "rejected". Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
J The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
J- The associated numerical value is an estimated quantity because the Quality Control criteria were not met. The result may be biased low.
U The material was analyzed for, but was not detected above the level of the associated value.
The associated value is either the sample quantitation limit or the sample detection limit.
ND Not Defined
NC Not Calculated because one or both values were reported below laboratory detection limits.
Bold RPD is above 35%

TABLE 14
September 2005 Dissolved Metals Sample Results Comparison with Historic Data
Concentrations in µg/L

Sample ID	GTSW01D		GTSW02D		GTSW03D		GTSW04D		GTSW05D		GTSW06D		GTSW07D	
Sample Location	Cement Creek downstream of Am. Tunnel Sept 2005 Data	Cement Creek downstream of N. Fork confl.(CC13) 10/1/96	American Tunnel Sept 2005 Data	American Tunnel (AT-INFEL) 11/05/02	Eveline Sept 2005 Data	Eveline 10/1/1996 (SO-24)	Lark Sept 2005 Data	Lark avg. six data pts. (1997-99)	Joe and John Sept 2005 Data	Joe & John avg. six data pts. (1996-99)	Silver Ledge Sept 2005 Data	Silver Ledge avg. of six data pts (1996-98)	Red & Bonita Sept 2005 Data	Red and Bonita (RB1) 9/5/02
Latitude	37.890735		37.89095		37.88826		37.89180		37.88937		37.87666		37.89678	
Longitude	-107.64998		-107.64826		-107.66512		-107.68269		-107.67806		-107.64454		-107.64487	
Field Parameters														
Flow rate (gpm)	1150	516	90	285	4	0	1	NA	1	NA	585	384	224	10
pH (S.U)	3.24	4.54	4.8	5.9	3.15	3.4	2.21	2.7	2.5	7.8	6.01	5.9	3.72	4.1
Temperature (°C)	7.3	8.5	8.3	12.3	5.3	3	8.9	3.6	2.5	2.9	6.2	0.84	12.3	11.8
Conductivity (mS/cm)	1.36	0.38	2.46	2.0	0.46	0.469	2.6	0.3	1.1	0.87	0.96	NA	1.57	0.67
Analyte														
Aluminum*	**11500**	1788	7570	3120	12200	11311	**41900**	1700	**14500**	7700	1000	1120	*3400*	7580
Cadmium*	**35.2**	11	4.8	8	11.9	10	**128**	20	51.8	37	*1.7*	5	*24.4*	61
Copper*	**1110**	210	18.6	20	49.5	55.7	**6490**	590	584	390	*5.2*	12	*64.3*	457
Iron*	**34200**	142	140000	98700	13000	14643	**314000**	17000	54800	36000	8050	13600	37700	34300
Lead*	**25.9**	6.1	*3.2*	29	1.6	1.4	**434**	142	384	690	*1*	12	*55.5*	189
Manganese*	**20400**	833	46200	37000	780	847.6	**1540**	191	**414**	170	2340	2500	25700	24000
Zinc*	**11500**	2545	16900	15000	906	853.6	**33900**	4300	11200	7100	679	812	11500	13200
Sulfate as SO_4 (mg/L)	**821**	125	1850	1880	197	168	**1530**	90	364	260	567	519	999	NA

* Chemical of Concern
1 - Sunnyside Gold September 2, 2005 letter to Colorado Division of Mining and Geology
Historic Values 1) September 1998 Reclamation Feasibility Report, Colorado Division of Mining and Geology
2) 5/24/04 Mine Inventory and Compilation of Mine-Adit Chemistry Data, USGS
Bold indicates a September 2005 value 200 % greater than the historic value
Italics indicates a September 2005 value less than 50 % of the historic value

TABLE 14
September 2005 Dissolved Metals Sample Results Comparison with Historic Data
Concentrations in µg/L
(continued)

Sample ID	GTSW08D			GTSW09D		GTSW10D		GTSW11D		GTSW12D		GTSW13D		GTSW14D	
Sample Location	Upper Gold King (7th Level) Sept 2005 Data	"Pre-bulkhead" Gold King sample average [1]	Gold King (GK) August 30, 2001 [1]	Mogul Sept 2005 Data	Mogul avg. of two data pts. (1996-99)	Grand Mogul Sept 2005 Data	Grand Mogul avg. five data pts. (1996-99)	North Fork at Cement Creek Confl. Sept 2005 Data	North Fork (CC12) at low flow 10/1/96	Gold Point Sept 2005	"Mine South of Mogul" (SO07) 6/25/1997	Black Hawk Sept 2005	Blackhawk 9/1/1996	Big Colorado Sept 2005	Big Colorado (SO17) 10/1/1996
Latitude	37.89458			37.90983		37.91015		37.89513		37.90828		37.88207		37.87688	
Longitude	-107.63837			-107.63846		-107.63225		-107.64676		-107.6379		-107.63492		-107.64599	
Field Parameters															
Flow rate (gpm)	135	4	29	27	9	0.5	17	149	90	27	14	358	41	18	18
pH (S.U)	2.89	NA	NA	2.85	2.9	2.75	3.2	2.72	2.68	6.19	3.0	6.72	6.4	4.17	4.56
Temperature (°C)	9.1	NA	NA	5.7	0.94	3.2	0.48	9.1	2.1	4.1	NA	8.4	46.4	7.1	9.0
Conductivity (mS/cm)	2.97	NA	NA	1.51	NA	1.07	NA	2.5	NA	0.47	0.71	1.52	1.18	0.79	1.46
Analyte															
Aluminum*	42400	360000	55000	*8150*	26000	11900	7900	39300	59000	*898*	5912	**362**	90	**6880**	1725
Cadmium*	128	605	150	*192*	880	133	92	112	100	*1*	28	2.1	2	6.6	4.8
Copper*	7860	67700	13100	*79.2*	9300	5280	3200	6490	6000	*5.3*	1991	2.6	7	25.4	15
Iron*	139000	1462000	207000	*31600*	89000	**38100**	15000	93400	80000	*5220*	48770	*100*	1080	59000	74949
Lead*	43.8	166	80	**313**	121	*2.5*	37	**19.8**	1.7	0.35		*1*	50	1	1.7
Manganese*	**84200**	87000	39000	34300	20400	10400	6700	**52800**	11000	*1410*	5420	5660	3530	1960	2210
Zinc*	46800	216000	41000	51100	64500	25000	17000	30900	20000	*881*	5316	927	930	871	1067
Sulfate as SO_4 (mg/L)	3210	NA	NA	**954**	450	**409**	190	**1730**	860	251	438	914	NA	466	446

* Chemical of Concern
1 Sunnyside Gold September 2, 2005 letter to Colorado Division of Mining and Geology
Historic Values 1) September 1998 Reclamation Feasibility Report, Colorado Division of Mining and Geology
2) 5/24/04 Mine Inventory and Compilation of Mine-Adit Chemistry Data, USGS
Bold indicates a September 2005 value 200 % greater than the historic value
Italics indicates a September 2005 value less than 50 % of the historic value

TABLE 15
September 2005 Dissolved Metals Loading Calculations
Concentrations in µg/L

Sample ID	GTSW01D		GTSW02D		GTSW03D		GTSW04D	GTSW05D		GTSW06D		GTSW07D	
Sample Location	Cement Creek downstream of Am. Tunnel Sample Results	% of Cement Creek accounted for by Mogul, American Tunnel, Red & Bonita, and Upper Gold King	American Tunnel Sample Results	% of Upper Cement Creek accounted for by American Tunnel	Eveline Sample Results	Ratio of Eveline to Upper Cement Creek	Lark Sample Results	Joe and John Sample Results	Ratio of Joe and John + Lark to Upper Cement Creek	Silver Ledge Sample Results	Ratio of Silver Ledge to Upper Cement Creek	Red & Bonita Sample Results	% of Upper Cement Creek accounted for by Red & Bonita
Flow rate (gpm)	1150		90		4		1	1		585		224	
Flow rate (lpm)	4400	41	341	7.7	15	0.0034	4	4	0.0017	2214	0.50	848	19
Analyte													
Aluminum*	11500		7570		12200		41900	14500		1000		3400	
Mass Al (lbs/day)	160	55	8.2	5.1	0.59	0.0037	0.50	0.17	0.0042	7.0	0.044	9.2	5.7
Cadmium*	35.2		4.8		11.9		128	51.8		1.7		24.4	
Mass Cd (lbs/day)	0.49	69	0.0052	1.1	0.00057	0.0012	0.0015	0.00062	0.0044	0.012	0.024	0.066	13
Calcium	199000		452000		5000		23400	5000		195000		255000	
Mass Ca (lbs/day)	2800	67	490	18	0.24	0.000086	0.28	0.060	0.00012	1400	0.50	690	25
Copper*	1110		18.6		49.5		6490	584		5.2		64.3	
Mass Cu (lbs/day)	16	84	0.020	0.13	0.0024	0.000153	0.078	0.0070	0.0055	0.037	0.0024	0.17	1.1
Iron*	34200		140000		13000		314000	54800		8050		37700	
Mass Fe (lbs/day)	480	100	150	31	0.62	0.0013	3.8	0.66	0.0092	57	0.12	100	21
Lead*	25.9		3.2		1.6		434	384		1.0		55.5	
Mass Pb (lbs/day)	0.36	90	0.0035	1.0	0.000077	0.000213	0.0052	0.0046	0.027	0.0070	0.019	0.15	41
Magnesium	15700		30800		10700		15400	5000		8820		18400	
Mass Mg (lbs/day)	220	65	33	15	0.51	0.0023	0.19	0.060	0.0011	62	0.28	50	23
Manganese*	20400		46200		780		1540	414		2340		25700	
Mass Mn (lbs/day)	280	97	50	18	0.037	0.000134	0.019	0.0050	0.000084	16	0.059	69	25
Potassium	5000		5000		5000		5000	5000		5000		5000	
Mass K (lbs/day)	70	41	5.4	7.7	0.24	0.0034	0.060	0.060	0.0017	35	0.50	13	19
Zinc*	11500		16900		906		33900	11200		679		11500	
Mass Zn (lbs/day)	160	89	18	11	0.044	0.000272	0.41	0.13	0.0034	4.8	0.030	31	19

* Chemical of Concern

TABLE 15
September 2005 Dissolved Metals Loading Calculations
Concentrations in µg/L
(Continued)

Sample ID	GTSW08D		GTSW09D		GTSW10D		GTSW11D			GTSW12D		GTSW13D		GTSW14D	
Sample Location	Upper Gold King(7th Level) Sample Results	% of Upper Cement Creek accounted for by Upper Gold King	Mogul Sample Results	% of Upper Cement Creek accounted for by Mogul	Grand Mogul Sample Results	% of Upper Cement Creek accounted for by Grand Mogul	North Fork at Cement Creek Confl. Sample Results	% of Upper Cement Creek accounted for by North Fork	% of North Fork accounted for by Upper Gold King (use only 114 gpm)	Gold Point	Ratio of Gold Point to Upper Cement Creek	Black Hawk	Ratio of Black Hawk to Upper Cement Creek	Big Colorado	Ratio of Big Colorado to Upper Cement Creek
Flow rate (gpm)	135		27		0.5		149			27		358		18	
Flow rate (lpm)	510	12	102	2.3	2	0.043	560	13	77	102	0.023	1355	0.31	68	0.015
Analyte															
Aluminum*	42400		8150		11900		39300			898		362		6880	
Mass Al (lbs/day)	69	43	2.6	1.7	0.071	0.045	70	44	83	0.29	0.0018	1.6	0.010	1.5	0.0093
Cadmium*	128		192		133		112			1		2.1		6.6	
Mass Cd (lbs/day)	0.21	42	0.062	13	0.00080	0.16	0.20	40	88	0.00032	0.00066	0.0090	0.018	0.001	0.0029
Calcium	391000		222000		20000		290000			83800		344000		101000	
Mass Ca (lbs/day)	630	23	72	2.6	0.12	0.0043	520	19	100	27	0.010	1500	0.54	22	0.0078
Copper*	7860		79.2		5280		6490			5.3		2.6		25.4	
Mass Cu (lbs/day)	13	82	0.026	0.17	0.032	0.20	12	74	93	0.0017	0.00011	0.011	0.00072	0.005	0.00035
Iron*	139000		31600		38100		93400			5220		100		59000	
Mass Fe (lbs/day)	230	48	10	2.1	0.23	0.048	170	35	110	1.7	0.0035	0.43	0.00090	13	0.027
Lead*	43.8		313		2.5		19.8			0.35		1		1	
Mass Pb (lbs/day)	0.071	20	0.10	28	0.000015	0.0042	0.035	10	170	0.00011	0.00031	0.0043	0.012	0.00022	0.00060
Magnesium	34800		13900		9730		29700			5000		14300		11900	
Mass Mg (lbs/day)	56	26	4.5	2.0	0.058	0.027	53	24	90	1.6	0.0074	62	0.28	2.6	0.012
Manganese*	84200		34300		10400		52800			1410		5660		1960	
Mass Mn (lbs/day)	140	50	11	4.0	0.062	0.022	94	34	130	0.46	0.0016	24	0.087	0.42	0.0015
Potassium	5000		5000		5000		5000			5000		5000		5000	
Mass K (lbs/day)	8.1	12	1.6	2.3	0.030	0.043	8.9	13	77	1.6	0.023	22	0.31	1.1	0.015
Zinc*	46800		51100		25000		30900			881		927		871	
Mass Zn (lbs/day)	76	47	17	10	0.15	0.094	55	34	120	0.29	0.0018	4.0	0.025	0.19	0.0012

* Chemical of Concern

TABLE 16
September 2005 Weighted Average Dissolved Metals Concentrations for Three Adits/Tunnel Discharge Compared to Cement Creek Concentrations in µg/L

Sample ID	GTSW02D	GTSW07D	GTSW08D	GTSW09D		GTSW01D
Sample Location	American Tunnel	Red & Bonita	Upper Gold King(7th Level)	Mogul	Total Flow from five adits/tunnel and Average Concentrations	Cement Creek downstream of Am. Tunnel
Flow rate (gpm)	90	224	135	27	480	1150
Field Parameters						
pH (S.U.)	4.8	3.72	2.89	2.85	3.54	3.24
Temperature (°C)	8.3	12.3	9.1	5.7	10	7.3
Conductivity (mS/cm)	2.46	1.57	2.97	1.51	2.1	1.36
Analyte						
Aluminum*	7570	3400	42400	8150	15390	11500
Cadmium*	4.8	24.4	128	192	60	35.2
Copper*	18.6	64.3	7860	79.2	2250	1110
Iron*	140000	37700	139000	31600	84700	34200
Lead*	3.2	55.5	43.8	313	56	25.9
Manganese*	46200	25700	84200	34300	46300	20400
Zinc*	16900	11500	46800	51100	25000	11500

* Chemical of Concern

TABLE 17
September 2005 Calculated Metals Loads and Concentrations at CC48 and A72 Using Two Water Treatment Alternatives at Gladstone

		Alternative 1 [1]			Alternative 2 [1]		
CC48 Flow rate	**CC48 9/15/2004 sample data**	**Metals removed (lbs/yr) [1]**	**Resulting CC48 metal concentrations**	**Percent metal load reduction at CC48**	**Metals removed (lbs/yr) [1]**	**Resulting CC48 metal concentrations**	**Percent metal load reduction at CC48**
Flow rate (cubic feet/second)	14						
Flow rate (liters/year)	1.25E+10						
Dissolved Metal Concentrations (µg/L) and Loads (pounds/yr)							
Aluminum Concentration	5150		4000			3000	
Aluminum Load	140000	31000		22	57000		42
Cadmium Concentration	9		5.08			3.27	
Cadmium Load	260	120		45	170		65
Copper Concentration	129		-40			-69	
Copper Load	3600	4700		130	5500		150
Iron Concentration	8236		1800			2200	
Iron Load	230000	180000		78	170000		73
Manganese Concentration	2953		800			540	
Manganese Load	81000	59000		73	66000		82
Zinc Concentration	2231		290			110	
Zinc Load	61000	53000		87	58000		95

1- Assume treatment to pH = 9.0 and resulting dissolved metal concentrations from CEMI report
Lead Data are unavailable for CC48 and A72
Alternative 1 = Mogul, Red & Bonita, Gold King Level 7, and American Tunnel
Alternative 2 = Upper Cement Creek 1200 gpm treated
Assumptions: 1. Conservation of mass;
2. Change in Cement Creek water chemistry due to treatment at Gladstone has no beneficial or detrimental over the remainder of the distance to A72.
3. Conditions at CC48 and A72 were comparable in 2004 to those in 2005.
4. Adit and Cement Creek flow rates and water chemistry are unchanged between 2004 and 2005

TABLE 17
September 2005 Calculated Metals Loads and Concentrations at CC48 and A72 Using Two Water Treatment Alternatives at Gladstone (Continued)

A72 Flow rate	A72 9/15/2004 sample data	Alternative 1 [1] Metals removed (lbs/yr)[1]	Alternative 1 [1] Resulting A72 metal concentrations	Alternative 1 [1] Percent metal load reduction at A72	Alternative 2 [1] Metals removed (lbs/yr) [1]	Alternative 2 [1] Resulting A72 metal concentrations	Alternative 2 [1] Percent metal load reduction at A72
Flow rate (cubic feet/second)	104						
Flow rate (liters/year)	9.27E+10						
Dissolved Metal Concentrations (µg/L) and Loads (pounds/yr)							
Aluminum Concentration	1660		1500			1400	
Aluminum Load	340000	31000		9.1	57000		17
Cadmium Concentration	2.51		1.9			1.7	
Cadmium Load	510	120		24	170		33
Copper Concentration	8.5		-15			-19	
Copper Load	1700	4700		276	5500		320
Iron Concentration	2259		1400			1400	
Iron Load	460000	180000		39	170000		37
Manganese Concentration	1153		900			850	
Manganese Load	240000	59000		25	66000		28
Zinc Concentration	654		380			350	
Zinc Load	130000	53000		41	58000		45

1 Assume treatment to pH = 9.0 and resulting dissolved metal concentrations from CEMI report
Lead Data are unavailable for CC48 and A72
Alternative 1 = Mogul, Red & Bonita, Gold King Level 7, and American Tunnel
Alternative 2 = Upper Cement Creek 1200 gpm treated
Assumptions: 1. Conservation of mass;
2. Change in Cement Creek water chemistry due to treatment at Gladstone has no beneficial or detrimental over the remainder of the distance to A72.
3. Conditions at CC48 and A72 were comparable in 2004 to those in 2005.
4. Adit and Cement Creek flow rates and water chemistry are unchanged between 2004 and 2005

TABLE 18
November 2005 Dissolved and Total Metals Sample Results
Concentrations in µg/L

Sample ID	GTSW01D	GTSW01	GTSW11D	GTSW11
EPA Sample ID	MH1G74	MH1G73	MH1G76	MH1G75
Sample Location	Cement Creek downstream of American Tunnel	Cement Creek downstream of Am. Tunnel	North Fork at Cement Creek Confluence	North Fork at Cement Creek Confluence
Flow rate (gpm)	1122	1122	95	95
Field Parameters				
pH (S.U.)	3.2		2.67	
Temperature (°F)	35.6		35.6	
Conductivity (mS/cm)	1.29		2.49	
Analyte	**Dissolved**	**Total**	**Dissolved**	**Total**
Antimony	2.0 U	2.0 U	2.0 U	2.0 U
Aluminum*	9640	9720	32500	32500 J
Arsenic	1.0 UJ	1.2 U	3.7 J-	5.3
Barium	14.8	14.1	10 U	10 U
Beryllium	4.0	4.1	13.5	13.6
Cadmium*	32.1 J	32.3	90.9 J	92.5
Calcium	195000	196000	306000	304000
Chromium	0.95 J -	0.96 J-	5.7 J	5.6
Cobalt	58.9 J	55.4	121 J	122
Copper*	921 J	864	4370 J	4550
Iron*	32600	34300	80000	82700
Lead*	26.6 J	27.4	22.1 J	23.8
Magnesium	14900	14900	28000	27800
Manganese*	20100	19800	47000	50900
Mercury	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	36.2 J	33.4	77 J	81.4
Potassium	1080 J	1070 J	1530 J	1540 J
Selenium	5.0 U	5.0 U	5.0 U	0.70 J
Silver	1.0 U	1.0 J	1.0 U	1.0 U
Sodium	5790	5470	7010	6910
Thallium	1.0 U	1.0 U	1.0 U	1.0 U
Vanadium	1.0 U	1.0 U	1.0 U	1.4
Zinc*	9060 J	8770 J	19200 J	19100 J

* Chemical of Concern

Data Qualifiers

J The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

UJ The reported quantitation limit is estimated because Quality Control criteria were not met. The element or compound was not detected.

J- The associated numerical value is an estimated quantity because the Quality Control criteria were not met. The result may be biased low.

TABLE 19
Comparison of 2005 Dissolved Metals Sample Results for Three Sampling Events
Concentrations in µg/L

Sample ID	GTSW01D			GTSW11D		
Sample Location	**Cement Creek downstream of Am. Tunnel**	**Cement Creek downstream of Am. Tunnel**	**Cement Creek downstream of Am. Tunnel**	**North Fork at Cement Creek Confluence**	**North Fork at Cement Creek Confluence**	**North Fork at Cement Creek Confluence**
Month	July	September	November	July	September	November
Flow rate gpm (Measurement method)	4200 (1)	1150 (1)	1122 (1)	380 (2)	149 (2)	95 (2)
Field Parameters						
pH (S.U.)	3.46	3.24	3.2	2.5	2.72	2.67
Temperature (°F)	49.6	45.1	35.6	39.3	48.3	35.6
Conductivity (mS/cm)	0.57	1.36	1.29	1.16	2.5	2.49
Analyte						
Aluminum*	3670	11500	9640	16600	39300	32500
Antimony	2.0 U	2 U	2 U	2.0 U	2 U	2 U
Arsenic	1.0 U	1 U	1 UJ	3.4	4.6	3.7 J-
Barium	18.5	16.6 J	14.8	9.0 J	10 UJ	10 U
Beryllium	1.0	4.1 J	4	3.3	16 J	13.5 J
Cadmium*	13.4	35.2	32.1 J	43.5	112	90.9 J
Calcium	72900	199000	195000	90700	290000	306000
Chromium	2.0 U	2 U	0.95 J-	5.2	8	5.7 J
Cobalt	18.1 J	58.6	58.9 J	43.9 J	144	121 J
Copper*	306	1110	921 J	2450	6490	4370 J
Iron*	6100	34200	32600	46500	93400	80000
Lead*	13.7	25.9 J	26.6 J	2.1	19.8 J	22.1 J
Magnesium	6680	15700	14900	12500	29700	28000
Manganese*	5650 R	20400 J	20100	9600 R	52800 J	47000
Mercury	0.20 U	0.2 U	0.2 U	0.20 U	0.2 U	0.2 U
Nickel	11.1	32.4	36.2 J	27.3	81.5	77 J
Potassium	674 J	5000 U	1080 J	371 J	5000 U	1530 J
Selenium	5.0 U	5 U	5 U	0.82 J	0.98 J	5 U
Silver	1.0 U	1 U	1 U	1.0 U	1 U	1 U
Sodium	10900	5100	5790	23600	5980	7010
Thallium	1.0 U	1 U	1 U	1.0 U	1 U	1 U
Vanadium	1.0 U	1 U	1 U	1.0 U	1.9	1 U
Zinc*	3580	11500 J	9060 J	8470	30900 J	19200 J

R Reported value is "rejected". Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
J The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
Flow rate Measurement Methods 1- Marsh McBirney; 2 - Flume

APPENDIX A

Photolog

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/20/2005

PHOTO 1

Facing north. View of Upper Gold King 7th Level east adit.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/20/2005

PHOTO 2

Facing southwest. View of flow rate measurement using a flume at the Grand Mogul.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/20/2005

PHOTO 3

Facing southeast. View of sample collection at the Grand Mogul.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/20/2005

PHOTO 4

Facing southeast. View of waste rock dump at the Grand Mogul.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/20/2005

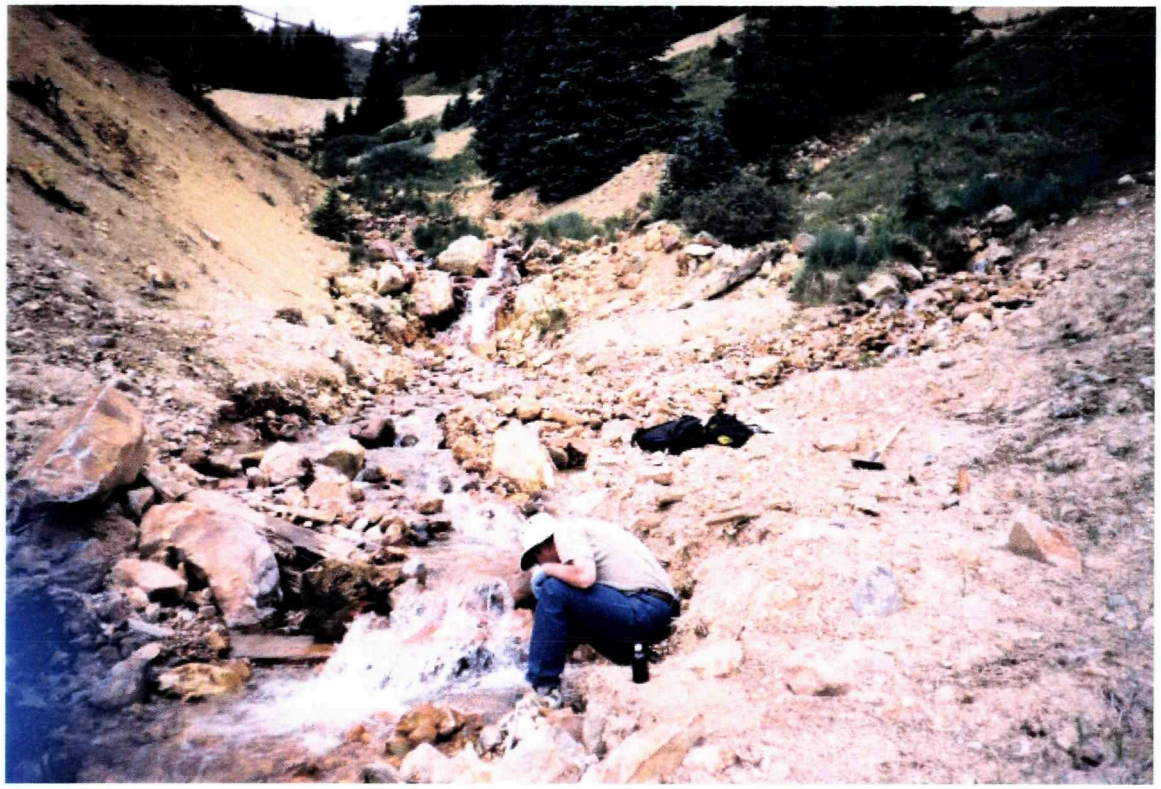
PHOTO 5

Facing east. View of seep at the toe of slope at the Grand Mogul.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/20/2005

PHOTO 6

Facing northeast. View of Mogul discharge flow measurement.



Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/20/2005

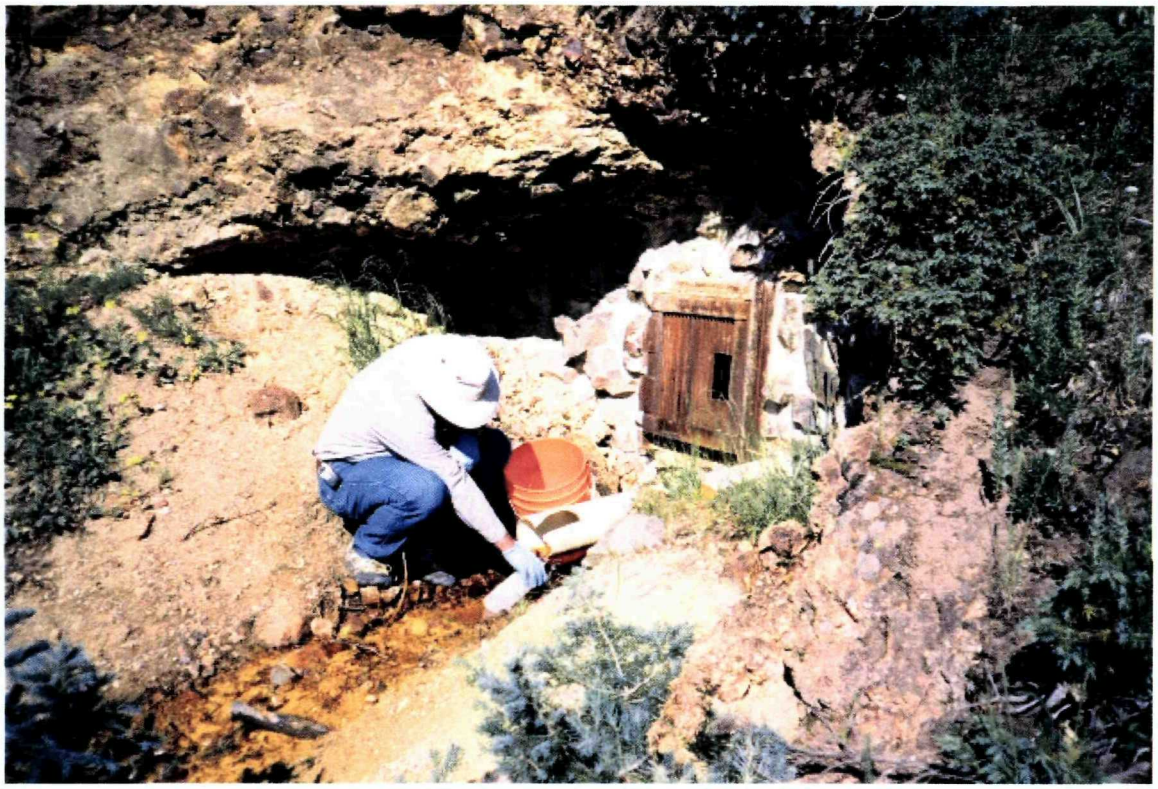
PHOTO 7

Facing northwest. View of sample collection from the Upper Prospect Gulch.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/20/2005

PHOTO 8

Facing southeast. View of sample collection at lower Prospect Gulch.



Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

PHOTO 9

Facing west. View of sample collection at the Eveline Mine adit.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

PHOTO 10

Facing east. View of sample collection from the North Fork near Cement Creek.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

PHOTO 11

Facing southeast. View of sample collection from Cement Creek at Gladstone.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

PHOTO 12

Facing east. View of American Tunnel.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

PHOTO 13

Facing northeast. View of piping from Upper Gold King 7th Level.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

PHOTO 14

Facing east. View of Red & Bonita collapsed adit.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

PHOTO 15

Facing east. View of "dead zone" southwest of Red & Bonita Mine.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

PHOTO 16

Facing northeast. View of sample location for the Red & Bonita Mine adit water.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

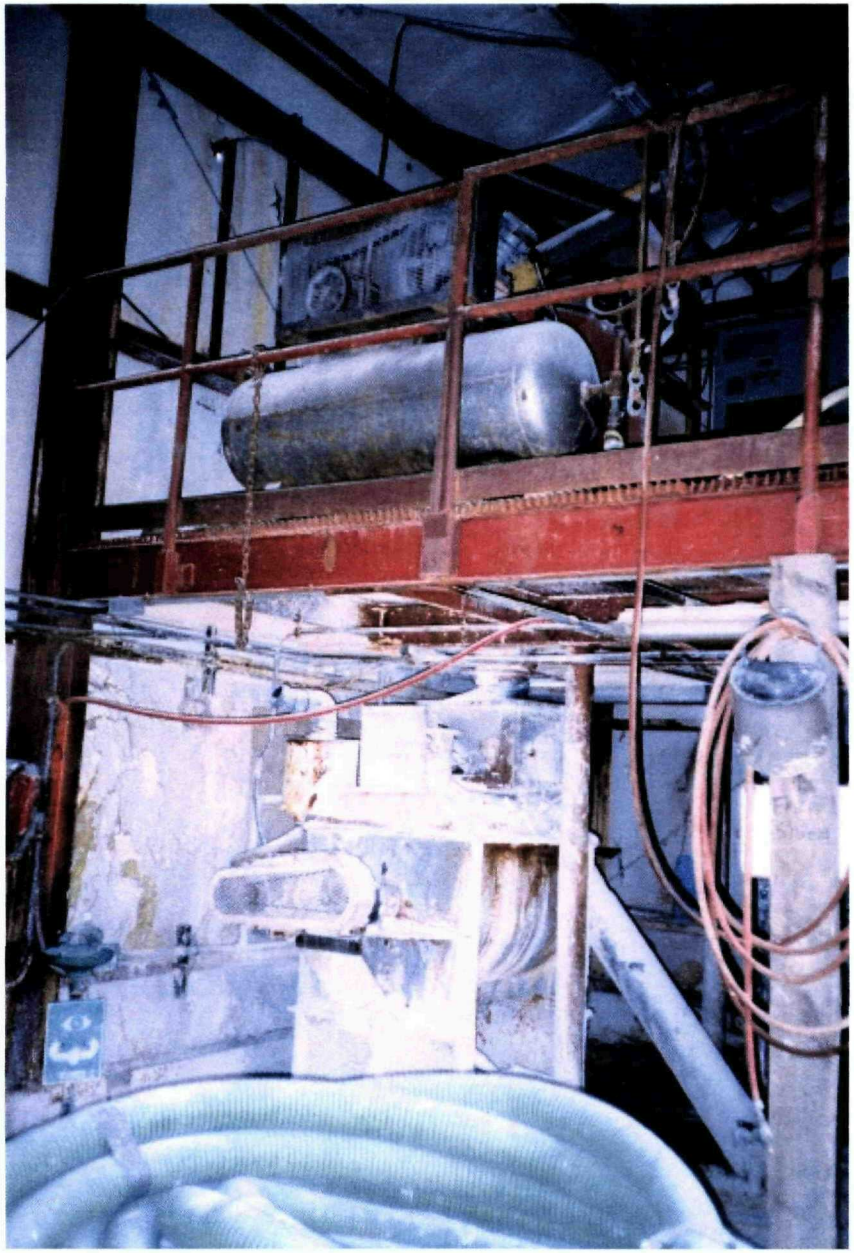
PHOTO 17

Facing east. View of Gladstone water treatment plant

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

PHOTO 18

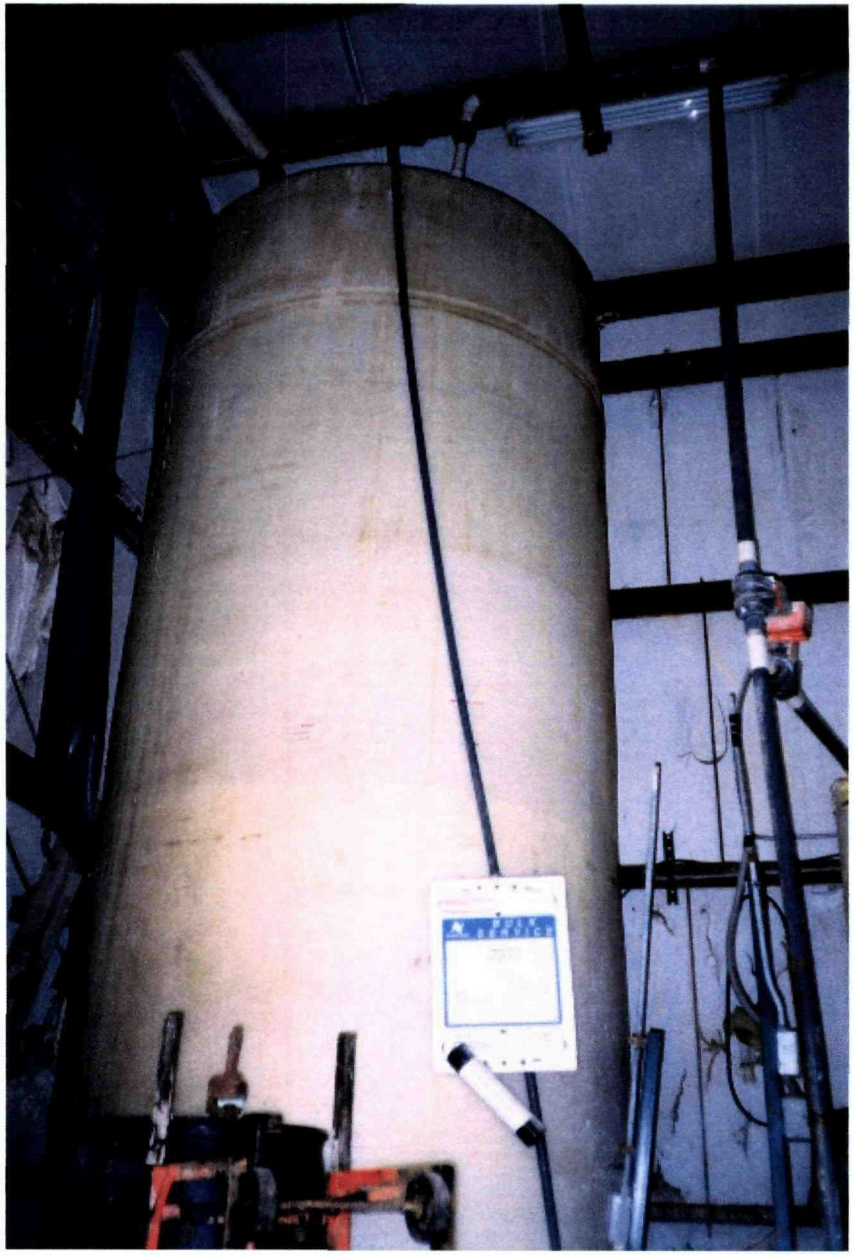
Facing north. View of Gladstone water treatment plant.



Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

PHOTO 19

View of Gladstone water treatment plant.



Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

PHOTO 20

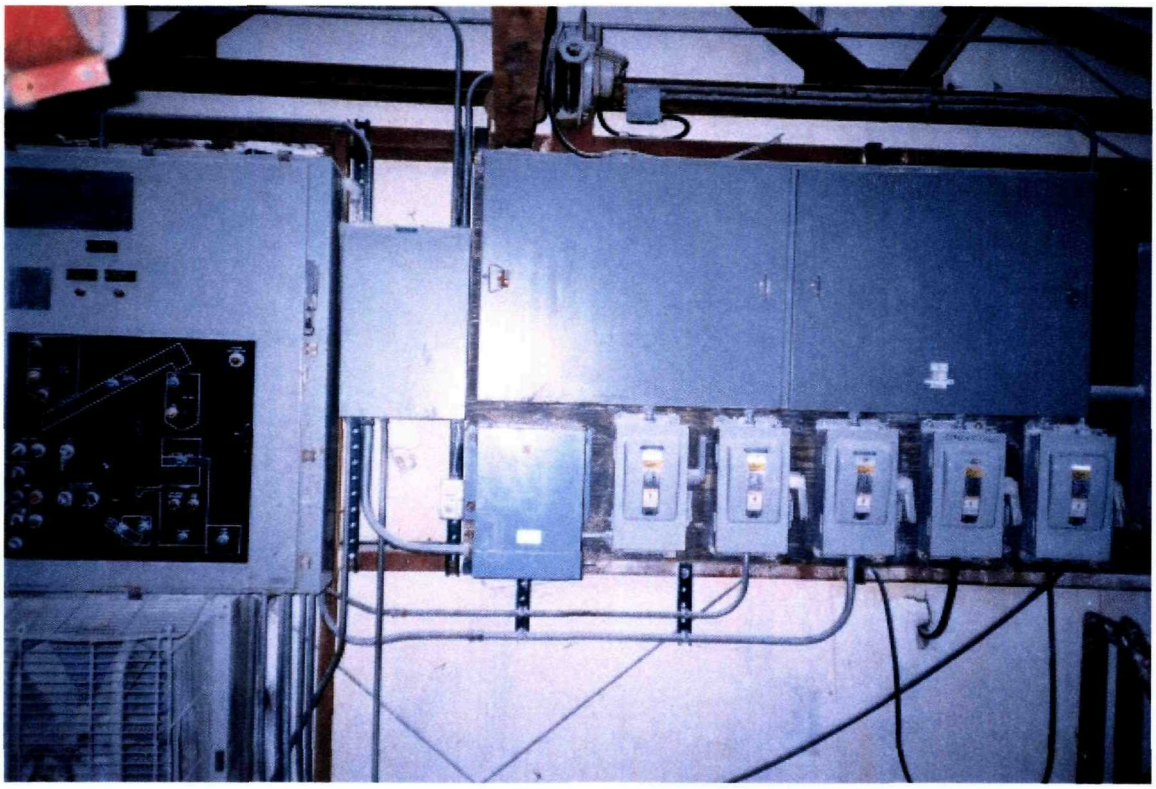
View of tank inside Gladstone water treatment plant.

TDD No. 0509-41
T:\START3\Gladstone_TBA\Photos\Photolog SAR.doc

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

PHOTO 21

View of upper level of Gladstone water treatment plant.



Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 07/21/2005

PHOTO 22

View of electrical service inside Gladstone water treatment plant.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 09/20/2005

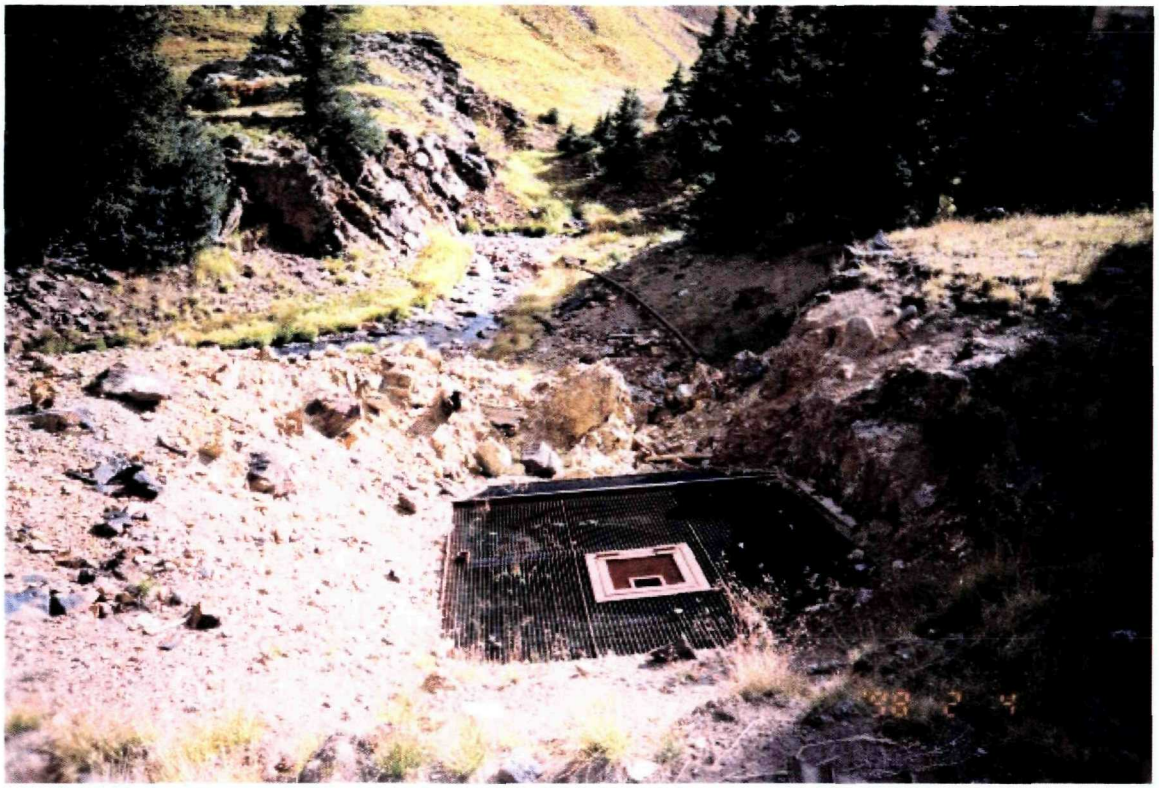
PHOTO 23

Facing west. View of collapsed Big Colorado Mine adit flow rate measurement.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 09/20/2005

PHOTO 24

Facing west. View of Grand Mogul flow rate measurement.



Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 09/20/2005

PHOTO 25

Facing east. View of Mogul shaft.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 09/20/2005

PHOTO 26

Facing east. View of collapsed Gold Point Mine adit.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 09/20/2005

PHOTO 27

Facing east. View of Pride of Bonita Mine adit with no discharge.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 09/20/2005

PHOTO 28

Facing east. View of Adams Mine adit with no discharge.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 09/20/2005

PHOTO 29

Facing northwest. View of Blackhawk Mine discharge flow rate measurement.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 09/20/2005

PHOTO 30

Facing southwest. View of Blackhawk Mine adit.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 09/20/2005

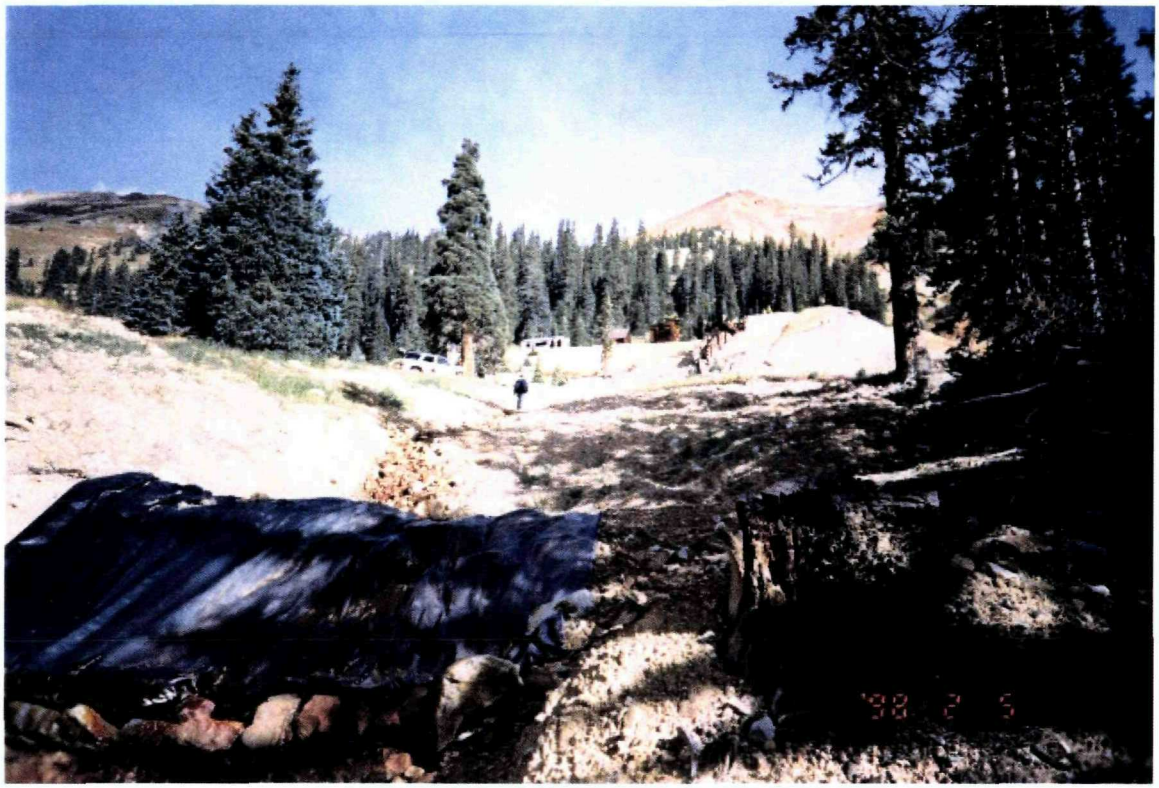
PHOTO 31

Facing north. View of Lead Carbonate Mine with no discharge.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 09/21/2005

PHOTO 32

Facing northeast. View of sample location downgradient of the Joe and John Mine.



Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 09/21/2005

PHOTO 33

Facing northeast. View of sample location downgradient from the Lark Mine.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 09/21/2005

PHOTO 34

Facing northeast. View of Lark Mine from Henrietta Mine 11th level.

Photographer: J. Goedert/UOS – Witness: Eric Scott/UOS -- Date: 09/21/2005

PHOTO 35

Facing southwest. View of Cement Creek sample location at Gladstone.

APPENDIX B

Analytical Data Sheets and Validation Reports (on a Compact Disk (CD))